



OPERATOR'S MANUAL

This manual has been prepared for and is considered part of -

18000

Luffing Jib Model Number

18005910

Luffing Jib Serial Number

This Manual is divided into the following sections:

SECTION 1 INTRODUCTION

SECTION 2 SAFETY INFORMATION

SECTION 3 OPERATING CONTROLS AND PROCEDURES

SECTION 4 SET-UP AND INSTALLATION

SECTION 5 LUBRICATION

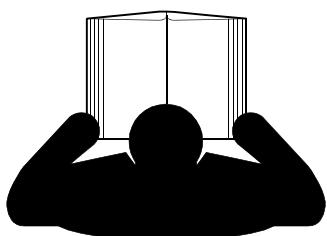
SECTION 6 MAINTENANCE

NOTICE

The serial number of the crane and applicable attachments (i.e. luffing jib, MAX-ER™) is the only method your distributor or the factory has of providing you with correct parts and service information.

The serial number is located on a crane identification decal attached to the operator's cab and each attachment. Refer to the Nameplate and Decal Assembly Drawing (in Operator's Manual) for the exact location of the crane identification decal.

Always furnish serial number of crane and its attachments when ordering parts or discussing service problems with your distributor or the factory.



WARNING

To prevent death or serious injury:

- Avoid unsafe operation and maintenance.
Crane and attachments must be operated and maintained by trained and experienced personnel. Manitowoc is not responsible for qualifying these personnel.
- Do not operate or work on crane or attachments without first reading and understanding instructions contained in Operator Information Manual and Service Manual supplied with crane and applicable attachments.
- Store Operator Information Manual and Service Manual in operator's cab.
If Operator Information Manual or Service Manual is missing from cab, contact your Manitowoc Crane Care distributor for a new one.

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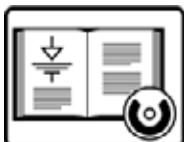
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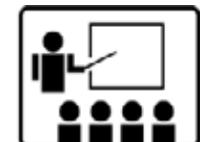
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SECTION 1

INTRODUCTION

CRANE DATA

See the end of this section for crane data specific to your crane:

- Basic Specifications.
- EC Declaration (if applicable).

CRANE/ATTACHMENT IDENTIFICATION

An identification label is attached to the outside of the operator's cab (see Figure 1-1) and to the attachments (i.e. luffing jibs, MAX-ER's, and Ringers) available for this crane.

The crane or attachment model, application, and serial number are provided on the label.

For the exact location of the identification labels on your crane and attachments, refer to the Nameplates and Decals Drawing in Section 2 of this manual.

CRANE ORIENTATION

The terms RIGHT, LEFT, FRONT, REAR used in this manual refer to operator's right, left, front, and rear sides when seated in the operator's cab looking forward.

- Operator's cab is at front of upperworks.
- Crawler motors are at rear of lowerworks.
- Crawler pin handles on carbody are at front of lowerworks.

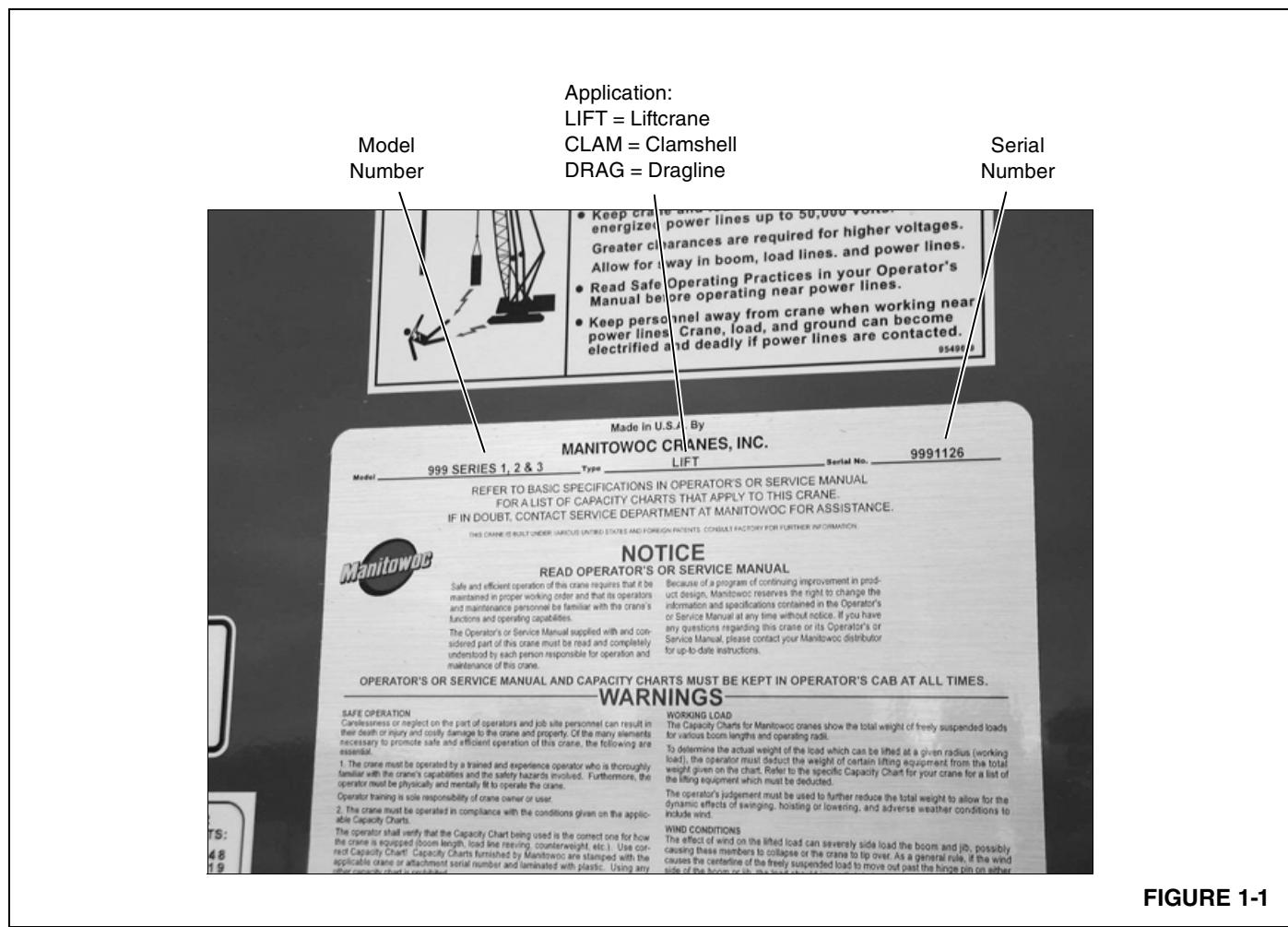


FIGURE 1-1

IDENTIFICATION AND LOCATION OF COMPONENTS

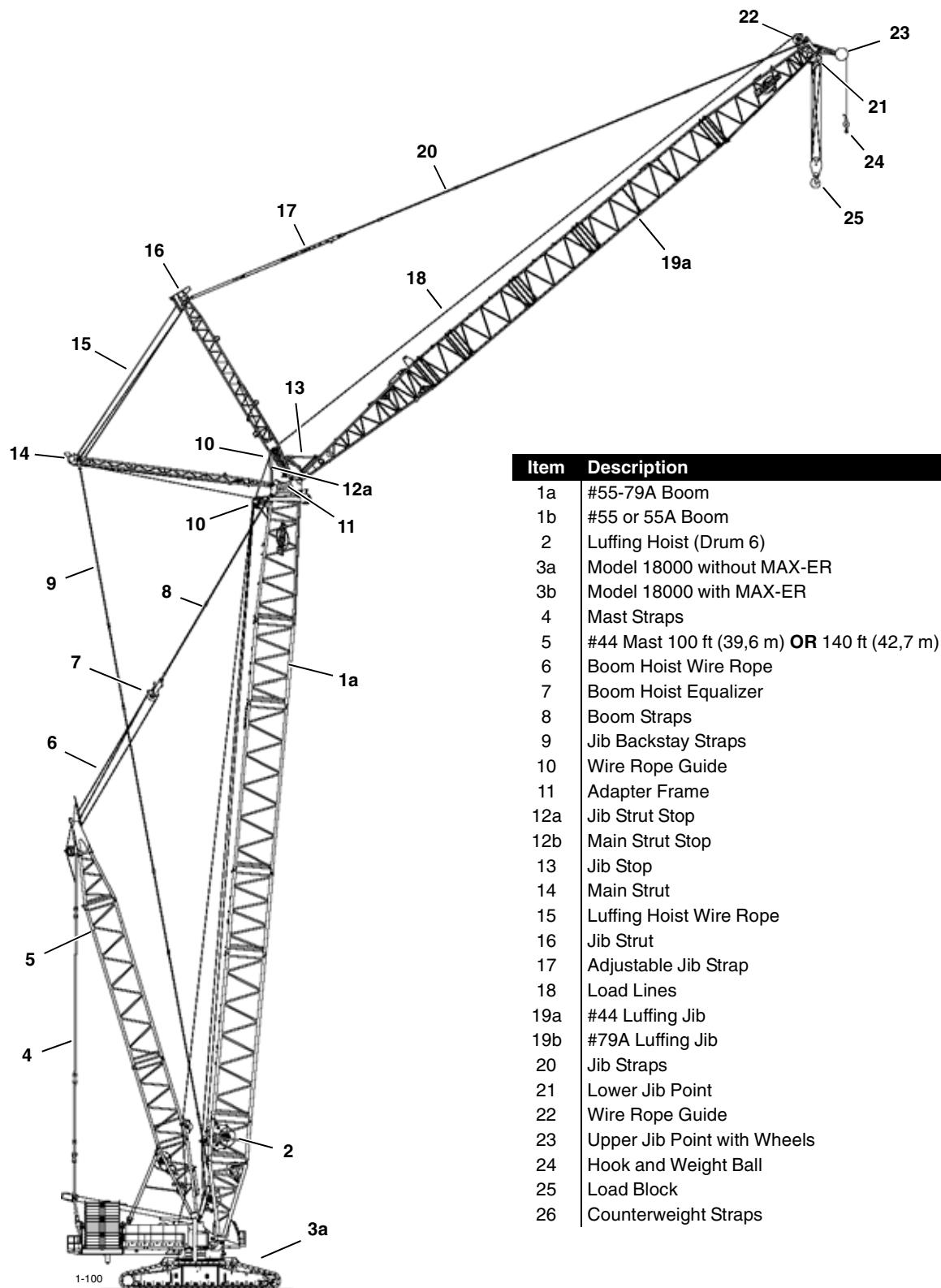


FIGURE 1-2

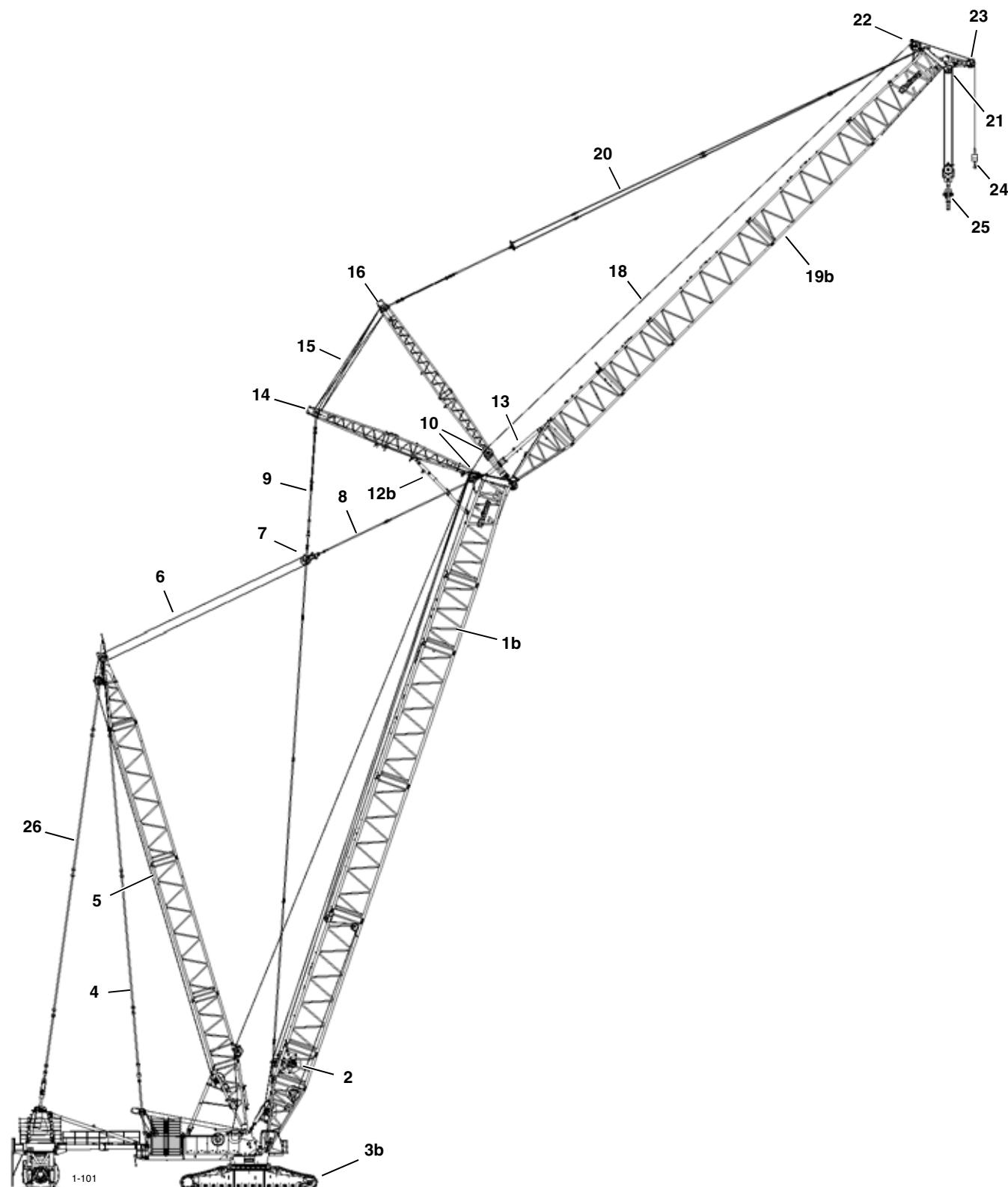
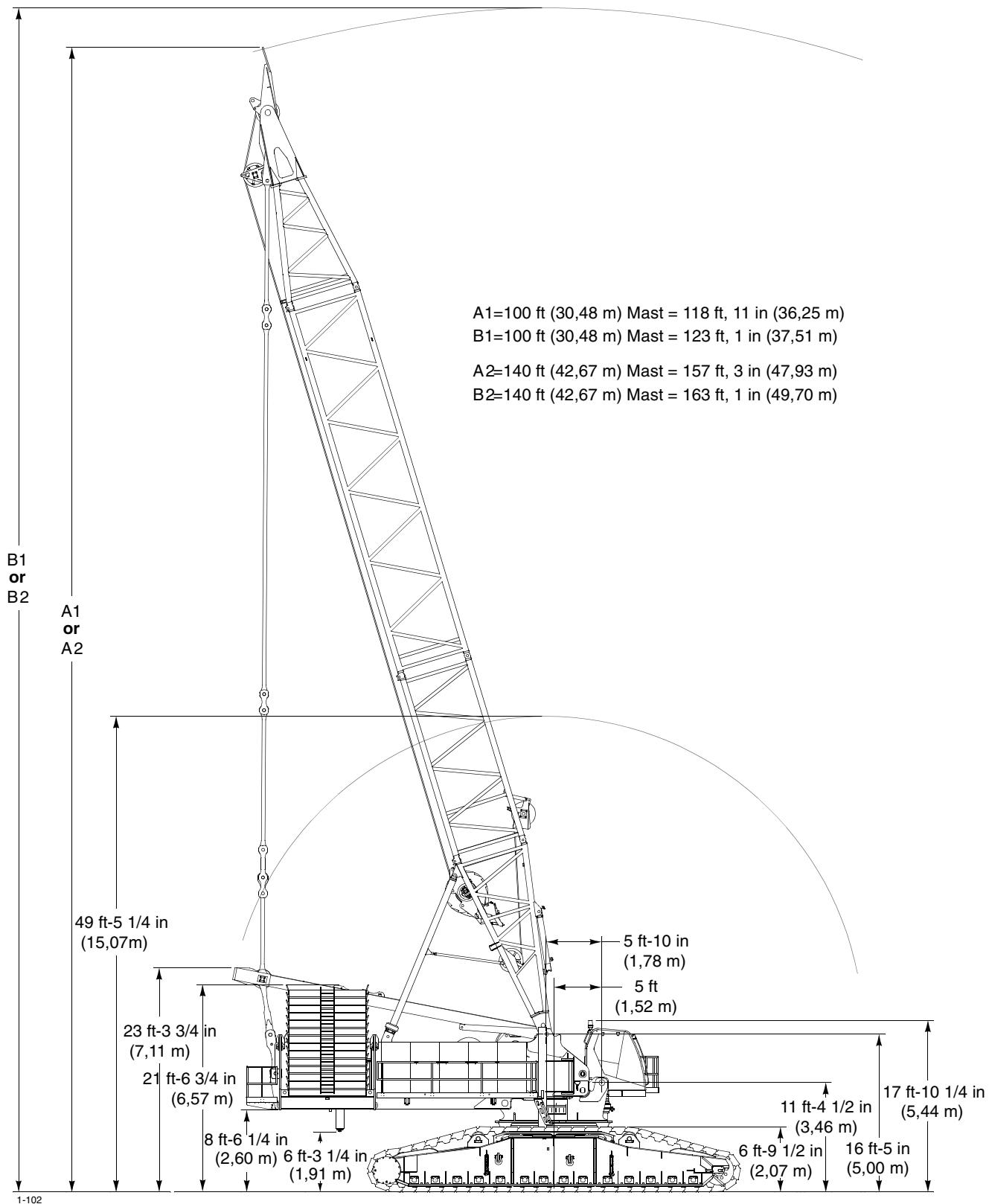
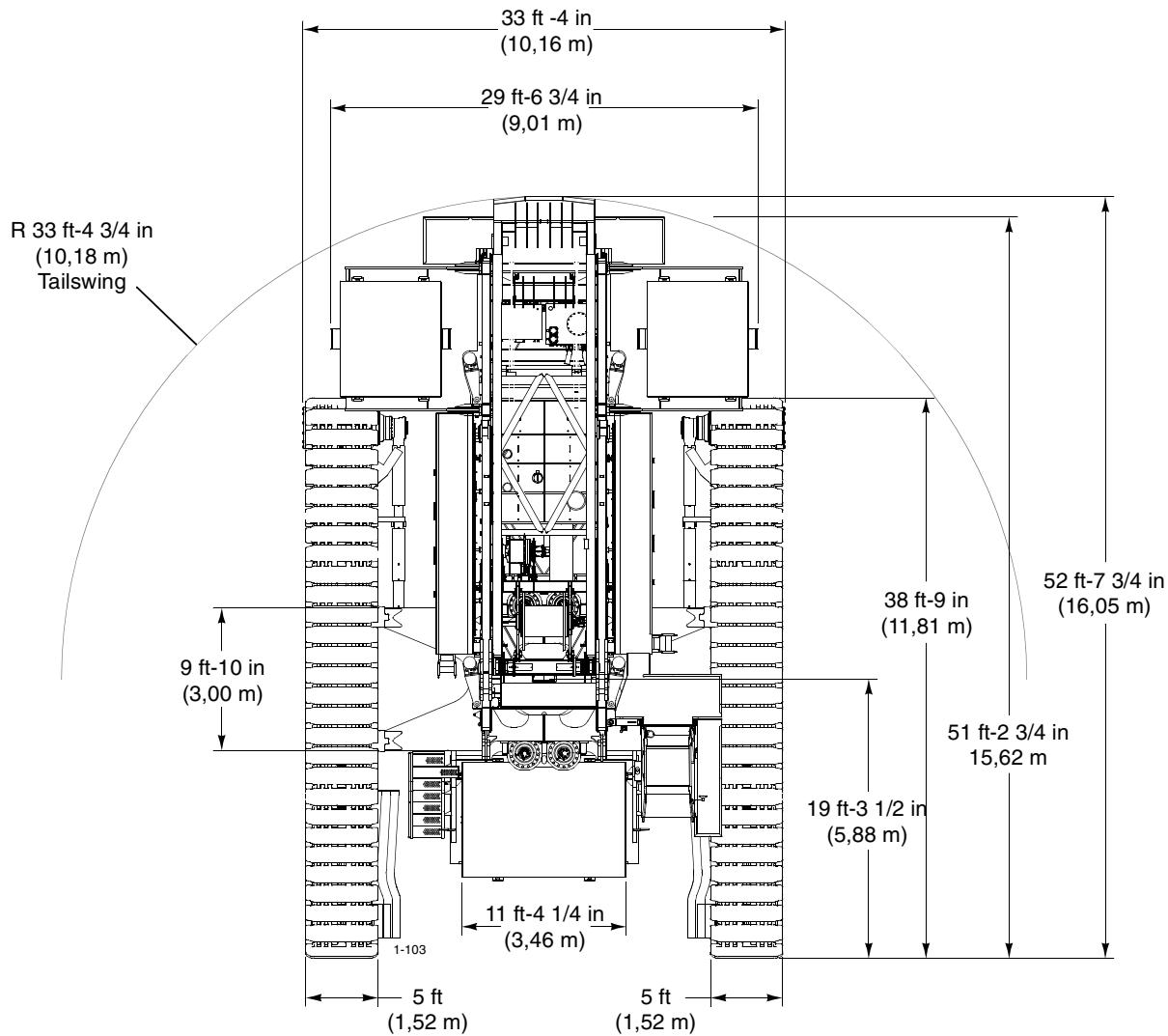


FIGURE 1-2 continued

OUTLINE DIMENSIONS



Outline Dimensions Continued on Next Page



CRANE WEIGHTS

Description		Weight Pounds	Weight Kilograms
LIFTCRANE:			
Upperworks and lowerworks complete, 4 swing drives, counterweight, 30 ft (9,1 m) live mast, backhitch, 100 ft (30,5 m) No. 56 Mast, mast stops, 30 USt (27 t) hook and weight ball, boom stops and load lines (includes self-erect and MAX-ER prep)			
When equipped with fully rigged 120 ft (36,6 m) Boom No. 55-79A, standard upper boom point, and 500 USt (454 t) block	- - - - -	1,478,930	670 831
When equipped with fully rigged 120 ft (36,6 m) Boom No. 55 or No. 55A, heavy duty upper boom point, and 661 USt (600 t) block	- - - - -	1,513,720	686 611
UPPERWORKS REAR MACHINERY MODULE:			
Rotating bed rear section with pin pullers, upperworks jacking system, 30 ft (9,1 m) live mast, mast hoist with mast hoist line, Cummins QXF15 power plant, hydraulic reservoir (full), fuel tank (1/2 full) and operators cab (drum 3 and catwalks removed)	- - - - -	104,435	47 370
Upperworks jacking system removed	- - - - -	88,335	40 068
ADAPTER FRAME WITH CARBODY:			
Rotating bed adapter frame with bearing turntable, 4 swing drives and carbody (includes MAX-ER prep)	- - - - -	95,900	43 499
MAST NO. 56 BUTT/TOP SHIPPING PACKAGE:			
20 ft (6,1 m) mast butt, boom hoist drum with rope, boom hoist drum guide rollers, wire rope guide sheave, mast stops, mast butt supports, boom equalizer, 20 ft (6,1 m) mast top with sheaves and straps (includes MAX-ER prep)	- - - - -	57,800	26 217
BOOM NO. 55 BUTT SHIPPING PACKAGE:			
20 ft (6,1 m) boom butt, load hoist drum with rope, luffing drum with rope, rigging winch with rope, cable reel, boom stops and boom hinge pin-pullers	- - - - -	57,875	26 251
BOOM NO. 55 - 10 ft (3,0m) INSERT SHIPPING PACKAGE:			
10 ft (3,0 m) insert, load hoist drum with rope and wire rope guide	- - - - -	35,960	16 311
CRAWLERS:			
38 ft 9 in (11 811 mm) crawler assembly (each) with drive and 60 in (1 524 mm) treads	- - - - -	88,255	40 031
COUNTERWEIGHT - UPPER:			
Tray (each)	- - - - -	12,050	5 465
Counterweight (28 total) (each)	- - - - -	18,000	8 164
Rear catwalk with railings	- - - - -	1,290	585
Total upperworks counterweight	- - - - -	528,000	239 496
COUNTERWEIGHT - LOWER:			
Counterweight tray (each)	- - - - -	28,000	12 700
Counterweight (each) (6 total - 3 front, 3 rear)	- - - - -	44,000	19 958
Stairway (each)	- - - - -	250	113
Total lowerworks counterweight	- - - - -	320,000	145 149
30 ft (9,1 m) LIVE MAST:			
30 ft (9,1 m) mast with straps	- - - - -	9,660	4 381
MACHINE OPTIONS:			
Drum 3 assembly (whip line without rope)	- - - - -	5,250	2 381
Upperworks jacking system	- - - - -	14,700	6 667
Swing drive assemblies (each)	- - - - -	1,765	800
Rotating bed alignment pendants (each)	- - - - -	65	29
LOWERWORKS OPTIONS:			
Carbody pedestals with pads (each)	- - - - -	410	185
MAST NO. 56:			
20 ft (6,1 m) mast butt with boom hoist drum with rope and guide sheave	- - - - -	33,905	15 379
20 ft (6,1 m) mast top with sheaves, wire rope guide and straps	- - - - -	20,485	9 291
40 ft (12,2 m) insert with straps	- - - - -	13,940	6 323
20 ft (6,1 m) insert with straps	- - - - -	8,490	3 850

Description	Weight Pounds	Weight Kilograms
7 ft 1 in (2,2 m) upper backhitch strap (each)	485	219
13 ft 4-1/4 in (4,1 m) lower backhitch strap (each)	615	278
40 ft (6,1 m) backhitch strap (with connector links) (each)	1,805	818
14 ft 8 in (4,5 m) backhitch strap (each)	665	301
Mast stop tube (each) with strut and pins	1,030	467
Mast support (each)	335	151
Wire rope guide (on mast butt for whip line)	490	222
Wire rope guide (on 20 ft [6,1 m] insert for whip line)	600	272
Boom hoist drum without rope	8,110	3 678
BOOM NO. 55-79A:		
20 ft (6,1 m) butt No. 55	18,440	8 364
30 ft (9,1 m) top with straps, upper and lower point and wire rope guide	26,620	12 074
20 ft (6,1 m) insert No. 79 with straps	7,260	3 293
40 ft (12,2 m) insert No. 79 with straps	12,130	5 502
40 ft (12,2 m) transition insert No. 55-79 with links	12,110	5 493
10 ft (3,0 m) insert No. 55	7,680	3 483
20 ft (6,1 m) insert No. 55	10,715	4 860
40 ft (12,2 m) insert No. 55 with sheaves	19,640	8 908
28 ft 2-15/16 in (8,6 m) basic strap (each)	355	161
20 ft (6,1 m) strap (with connector links) (each)	290	131
40 ft (12,2 m) strap (with connector links) (each)	525	238
Links (attached to equalizer) (each set) with pins	95	43
Equalizer with pins	3,675	1 666
Boom stop (each tube)	1,795	814
Drum 1 or 2 assembly (load hoist without rope)	9,970	4 522
BOOM NO. 55 OR NO. 55A:		
20 ft (6,1 m) butt	18,440	8 364
30 ft (9,1 m) top with straps, upper and lower point and wire rope guide	40,700	18 461
10 ft (3,0 m) insert	7,680	3 483
20 ft (6,1 m) insert	10,715	4 860
40 ft (12,2 m) insert	18,485	8 384
40 ft (12,2 m) insert with equalizer rails	19,185	8 702
40 ft (12,2 m) insert (medium)	13,685	6 207
40 ft (12,2 m) insert with sheaves	19,640	8 908
28 ft 2-11/16 in (8,6 m) basic strap (each)	755	342
20 ft (6,1 m) strap (with connector links) (each)	610	276
40 ft (12,2 m) strap (with connector links) (each)	1,120	508
Links (attached to equalizer) (each set) with pins	110	49
Equalizer with pins	3,675	1 666
Boom stop (each tube)	1,795	814
Drum 1 or 2 assembly (load hoist without rope)	9,970	4 522
LUFFING JIB NO. 44:		
40 ft (12,2 m) butt	8,605	3 903
12 ft (3,7 m) lower butt	4,430	2 009
28 ft (8,5 m) upper butt	5,305	2 406
30 ft (9,1 m) top with straps, upper and lower point	14,090	6 391
10 ft (3,0 m) insert No. 44	1,890	857
20 ft (6,1 m) insert No. 44	3,215	1 458
40 ft (12,2 m) insert No. 44	5,420	2 458
Luffing jib adapter	4,600	2 086
31 ft 1-3/16 in (9,5 m) basic strap (each)	400	181
20 ft (6,1 m) strap (with connector links) (each)	290	131
40 ft (12,2 m) strap (with connector links) (each)	525	238
Adjustable strap (each) with pins	1,565	709



Description	Weight Pounds	Weight Kilograms
50 ft (15,2 m) jib strut with guide sheave, luffing sheaves and links	13,285	6 025
47 ft (14,3 m) main strut with luffing sheaves and links	9,425	4 275
Luffing wire rope guide	1,070	485
38 ft 2 in (11,6 m) backstay basic strap (with connector links) (each)	510	231
10 ft (3,0 m) backstay strap (with connector links) (each)	175	79
20 ft (6,1 m) backstay strap (with connector links) (each)	290	131
40 ft (12,2 m) backstay strap (with connector links) (each)	525	238
40 ft (12,2 m) transition backstay strap (with connector links) (each)	525	238
10 ft (3,0 m) No. 55 backstay strap (with connector links) (each)	405	183
20 ft (6,1 m) No. 55 backstay strap (with connector links) (each)	675	306
40 ft (12,2 m) No. 55 backstay strap (with connector links) (each)	1,220	553
Backstay link (attached to boom butt) (each)	115	52
Luffing jib stop assembly	1,850	839
Upper point (single sheave) with rollers	1,220	553
FIXED JIB NO. 79A:		
20 ft (6,1 m) butt No. 79A	10,295	4 669
30 ft (9,1 m) top with double straps, upper (heavy duty) and lower point and wire rope guide	27,780	12 600
20 ft (6,1 m) insert No. 79 with double straps	7,835	3 553
40 ft (12,2 m) insert No. 79 with double straps	13,180	5 978
28 ft 2-15/16 in (8,6 m) basic strap (each)	355	161
20 ft (6,1 m) jib strap with links (each)	290	131
40 ft (12,2 m) jib strap with links (each)	525	238
Equalizing link (each)	375	170
10 ft (3,0 m) strap (with connector links) (each) (20 degree offset)	355	161
7 ft (2,1 m) strap (with connector links) (each)	345	156
4 ft 9 in (1,4 m) strap with pin (each)	195	88
4 ft 9 in (1,4 m) link with pin (set each)	185	83
6 ft 2 in (1,9 m) strap with pin (each)	265	120
Jib stop assembly (each)	1,890	857
Jib hinge pins/link assembly (each)	340	154
29 ft (8,8 m) strut butt	5,325	2 415
21 ft (6,4 m) strut top	4,625	2 097
1 ft 5 in (0,4 m) spreader link with pins	690	312
1 ft 10 in (0,6 m) link with pins (each)	225	102
1 ft 10 in (0,6 m) link (each)	135	61
1 ft 7 in (0,5 m) spreader link with pins (each)	535	242
Adjustable link with pins (each)	585	265
7 ft 4 in (2,2 m) backstay strap (each)	275	124
30 ft (9,1 m) backstay strap with links (each)	865	392
20 ft (6,1 m) backstay strap with links (each)	610	276
40 ft (12,2 m) backstay strap with links (each)	1,120	508
10 ft (3,0 m) backstay strap with links (each)	355	161
1 ft 11-1/2 in (0,6 m) backstay link, pins (each set)	115	52
LUFTING JIB NO. 79A:		
20 ft (6,1 m) butt No. 79A	10,315	4 678
30 ft (9,1 m) top with double straps, upper (heavy duty) and lower point and wire rope guide	27,835	12 625
20 ft (6,1 m) insert No. 79 with double straps	7,835	3 553
20 ft (6,1 m) insert No. 79 without straps	6,700	3 039
40 ft (12,2 m) insert No. 79 with double straps	13,180	5 978
28 ft 2-15/16 in (8,6 m) basic strap (each)	355	161
20 ft (6,1 m) jib strap with links (each)	290	131
40 ft (12,2 m) jib strap with links (each)	525	238
Equalizing link (each)	375	170
8.63 in (0,2 m) link, pins (each set)	85	38

Description	Weight Pounds	Weight Kilograms
17 ft 10-1/2 in (5,4 m) strap (each)	495	224
1 ft 6 in (0,5 m) link (each)	115	52
Spreader with pins	180	81
13 ft 10-1/4 in (4,2 m) strap	850	385
Spreader link, pins	100	45
1 ft 6 in (0,5 m) link (each)	120	54
4 ft 2 in (1,3 m) strap, pin (each)	380	172
Jib hinge pins/link assembly (each)	340	154
Jib stop assembly (each)	2,715	1 231
Automatic jib stop assembly	40	18
30 ft (9,1 m) jib strut top with point sheaves	8,790	3 987
29 ft (8,8 m) jib strut butt with wire rope guide	5,900	2 676
21 ft (6,4 m) main strut top with point sheaves and raising pendant	8,550	3 878
29 ft (8,8 m) main strut butt	5,365	2 433
Main strut stop assembly (each)	1,980	898
8 ft 9-1/4 in (2,7 m) strap (each)	260	117
4 ft (1,2 m) link with pins (each set)	180	81
3 ft 10-1/2 in (14,2 m) adjustable strap (each)	160	72
20 ft (6,1 m) backstay strap with link (each)	610	276
40 ft (12,2 m) backstay strap with link (each)	1,120	508
10 ft (3,0 m) backstay strap with link (each)	360	163
1 ft 11-1/2 in (0,6 m) backstay link with pin (each set)	115	52
Boom dolly with adapter frame, pins	7,800	3 538
BOOM OPTIONS:		
Drum 6 assembly (luffing hoist with rope)	11,615	5 268
Standard upper boom point (single sheave)	1,115	505
Heavy duty upper boom point (single sheave)	1,630	739
661 USt (600 t) load block	25,100	11 385
500 USt (454 t) load block	24,500	11 113
450 USt (408 t) load block	21,300	9 661
350 USt (318 t) load block	17,400	7 892
100 USt (91 t) load block (self-erect)	3,900	1 769
30 USt (27 t) hook and weight ball	2,800	1 270
15 USt (14 t) hook and weight ball	1,800	816
WIRE ROPE:		
Mast hoist		
1,230 ft (375 m) of 22 mm wire rope - 1.80 lb per ft (2,68 kg/m)	2,215	1 004
Boom hoist		
4,370 ft (1 332 m) of 1-1/8 in (28,6 mm) wire rope - 2.60 lb per ft (3,87 kg/m)	11,360	5 152
Luffing Jib Hoist		
1 in (25,4 mm) wire rope - 2.00 lb per ft (2,98 kg/m)		
1,700 ft (518 m) No. 44 Luffing Jib	3,400	1 542
3,100 ft (945 m) No. 79A Luffing Jib	6,200	2 812
Load lines		
32 mm wire rope - 3.74 lb per ft (5,57 kg/m)		
3,700 ft (1 128 m) Drum 1	13,840	6 277
3,400 ft (1 036 m) Drum 2	12,715	5 767
28 mm wire rope - 2.76 lb per ft (4,11 kg/m)		
4,800 ft (1 463 m) Drum 1	13,250	6 010
4,000 ft (1 158 m) Drum 2	11,040	5 007
Whip lines		
28 mm wire rope - 2.76 lb per ft (4,11 kg/m)		
1,900 ft (579 m) Drum 3	5,245	2 379



ENGLISH AND METRIC CONVERSIONS

Direct Conversion

MULTIPLY (x) known value by conversion factor to obtain equivalent value in desired units. For example, 12 ft is converted to meters (m), as follows:

$$12 \text{ ft} \times 0.3048 = 3,6576 \text{ m}$$

Inverse Conversion

DIVIDE (/) known value by conversion factor to obtain equivalent value in desired units. For example, 3,6576 m is converted to feet, as follows:

$$3,6576 \text{ m} / 0.3048 = 12$$

To Convert	Symbol	Application	To	Symbol	Multiply By
AREA					
Square Inch	in ²	Filter Area Clutch Contact	Square Centimeter	cm ²	6.4516
Square Foot	ft ²	Ground Contact	Square Meter	m ²	0.0929
FORCE					
Pound Force	lb	Pedal Effort	KiloNewton Newton	kN N	0.00445 4.4482
Pound Force	lb	Line Pull	KiloNewton	kN	0.00445
Pound Force Per Inch	lb/in.	Spring Force	Newton per millimeter	Nmm	0.1751
Pound Force Per Foot	lb/ft		Newton per meter	Nm	14.5939
LENGTH					
Inch	in.	Adjustments	Millimeter	mm	25.4000
Foot	ft	Outline Dimensions	Meter	m	0.3048
Mile	miles	Travel Distance	Kilometer	km	1.6093
POWER					
Horsepower	hp	Engine	Kilowatt	kW	0.7457
PRESSURE					
Pound/Sq. In.	psi	Hydraulic & Air	Bar		0.0689
TEMPERATURE					
Degrees Fahrenheit	°F	Oil, Air, Etc.	Degrees Centigrade	°C	°F - 32 / 1.8
Degrees Centigrade	°C		Degrees Fahrenheit	°F	°C x 1.8 + 32
TORQUE					
Inch Pound	in lb	Bolt Torque	Newton Meter	Nm	0.1129
Foot Pound	ft lb		Newton Meter	Nm	1.3558
VELOCITY					
Miles Per Hour	mph	Vehicle Speed	Kilometers Per Hour	km/h	1.6093
Miles Per Hour	mph	Wind Speed	Meters Per Second	m/s	0.4470
Feet Per Minute	fpm	Line Speed	Meters Per Minute	m/min	0.3048
VOLUME					
Cubic Yard	yd ³	Bucket Capacity	Cubic Meter	m ³	0.7646
Cubic Foot	ft ³		Cubic Meter	m ³	0.0283
Cubic Inch	in ³	Pump Displacement	Cubic Centimeter	cm ³	16.3871

To Convert	Symbol	Application	To	Symbol	Multiply By
VOLUME (LIQUID)					
Ounce	oz	Fluid Capacities	Milliliter	mL	29.5735
Pint	pt		Liter	L	0.4732
Quart	qt		Liter	L	0.9464
Gallon	gal		Liter	L	3.7854
Gallon Per Minute	gpm	Pump Flow	Liters Per Minute	L/min	3.7854
WEIGHT					
Pound	lb	Unit/Component	Kilogram	kg	0.4536
US Ton (2,000 lb)	USt	Load Ratings	Metric Ton	t	0.9072
US Ton (2,000 lb)	USt		Kilogram	kg	907.1847

MANITOWOC CRANE CARE DISTRIBUTORS

To locate the Manitowoc Crane Care distributor nearest you:

1. Go to www.manitowoc.com.
2. Click on Manitowoc logo.
3. Click on **Dealers**.

4. Follow on-screen instructions to locate your Manitowoc Crane Care distributor.

When calling a distributor with parts or service questions, you need to know the model and serial number of your crane or attachment. This information is located on the Crane Identification Label on the crane cab or on the attachment.





OPERATOR'S MANUAL SECTION 1 INSERTS
18000 Luffing Jib – Serial Number 18005910

Basic Specs.

--

Basic Specs.



Manitowoc Cranes, Inc.

Serial #: 18005910

BASIC SPECIFICATION

TYPE: LUFFING JIB ATTACHMENT
MODEL: 18000 LUFFING JIB
S.O. NUMBER: 1850
SERIAL NO: 18005910
MONTH SHIPPED: AUGUST 2008

#55/79A BOOM RIGGING BOOM DATA
BOOM LENGTH

SECTION	PART#	LENGTH	STRAP	LENGTH	
			2-194993-2	38' - 2"	BASIC BACKSTAY
			2-A05198-2	10'	JIB BACKSTAY
			2-A05196-2	20'	JIB BACKSTAY
			2-A05197-2	40'	JIB BACKSTAY
			2-A07111-2	40'	JIB BACKSTAY
			2-179838-2	20'	JIB BACKSTAY
			6-179839-2	40'	JIB BACKSTAY

LUFFING JIB DATA

RIGGING ASSEMBLY: #A07766 JIB TYPE: #44 JIB LENGTH: 140 FT

SECTION	PART #	LENGTH	STRAP	LENGTH	
BUTT:	171283-7	12 FT			
BUTT:	171284-6	28 FT	2-179840-2	31' - 1"	BASIC
TOP:	179915-9	30 FT	2-179841-2		
INSERT:	179912-9	10 FT	2-179837-2	10' - 0"	INSERT
INSERT:	179913-2	20 FT	2-179838-2	20' - 0"	INSERT
INSERT:	179914-2	40 FT	2-179839-2	40' - 0"	INSERT
MAIN STRUT:	194161-2	47 FT			
JIB STRUT:	194159-9	50 FT			

MACHINE DATA

DRUMS	LAGGING	WEDGE	ROPE SIZE
LUFFING HOIST: A05274-2	NONE	19616-2	1"

LUFFING JIB WIRE ROPE

JIB HOIST: 1700 FT 1" DYFORM 8PI #A14127-3

CAPACITY CHARTS

COUNTERWEIGHT ARRANGEMENTS: 8577-A

DRUM AND LAGGING CHART: 8512-A

LIECTRANE BOOM CAPACITIES WITH LIFTING JIB ATTACHED:

LIFTING BOOM CAPACITIES WITH LIFTING JIB ATTACHED

LIFTCRANE BOOM CAPACITIES WITH LIFTING JIB AND LIFTCRANE FIXED JIB CAPACITIES ON LIFTING JIB

LIFTCRANE FIXED JIB CAPACITIES ON HUFFING

MAXIMUM ALLOWABLE TRAVEL SPECIFICATIONS: 8543-A

**MAXIMUM ALLOWABLE TRAVEL
OPERATING RANGE DIAGRAM**

OPERATING RANGE DIAGRAM:

RAISING/LOWERING PROC

RANGE DIAGRAM: A07738



Manitowoc Cranes, Inc.

Serial #: 18005910

WIND CONDITIONS: FOLIO 2067

WIRE ROPE SPECIFICATIONS: 8516-A

SECTION 2

SAFETY INFORMATION

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SECTION 2 SAFETY INFORMATION

DIESEL ENGINE EXHAUST

CALIFORNIA PROPOSITION 65 WARNING

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

NAMEPLATES AND DECALS

See drawing at the end of this section.

SAFETY MESSAGES

General

The importance of safe operation and maintenance cannot be over emphasized. Carelessness or neglect on the part of operators, job supervisors and planners, rigging personnel, and job site workers can result in their death or injury and costly damage to the crane and property.

To alert personnel to hazardous operating practices and maintenance procedures, safety messages are used throughout the manual. Each safety message contains a safety alert symbol and a signal word to identify the hazard's degree of seriousness.

Safety Alert Symbol



This safety alert symbol means **ATTENTION!** Become alert — **your safety is involved!** Obey all safety messages that follow this symbol to avoid possible death or injury.

Signal Words

DANGER

Identifies **imminent hazards** that will result in death or serious injury if the message is ignored.

WARNING

Identifies **potential hazards** that could result in death or serious injury if the message is ignored.

CAUTION

Identifies **potential hazards** that could result in minor or moderate injury if the message is ignored.

CAUTION

Without the safety alert symbol, identifies **potential hazards** that could result in property damage if the message is ignored.

NOTE: Highlights operation or maintenance procedures.

Safety Symbols

Safety symbols used in the decals on this crane are identified in Figure 2-1.

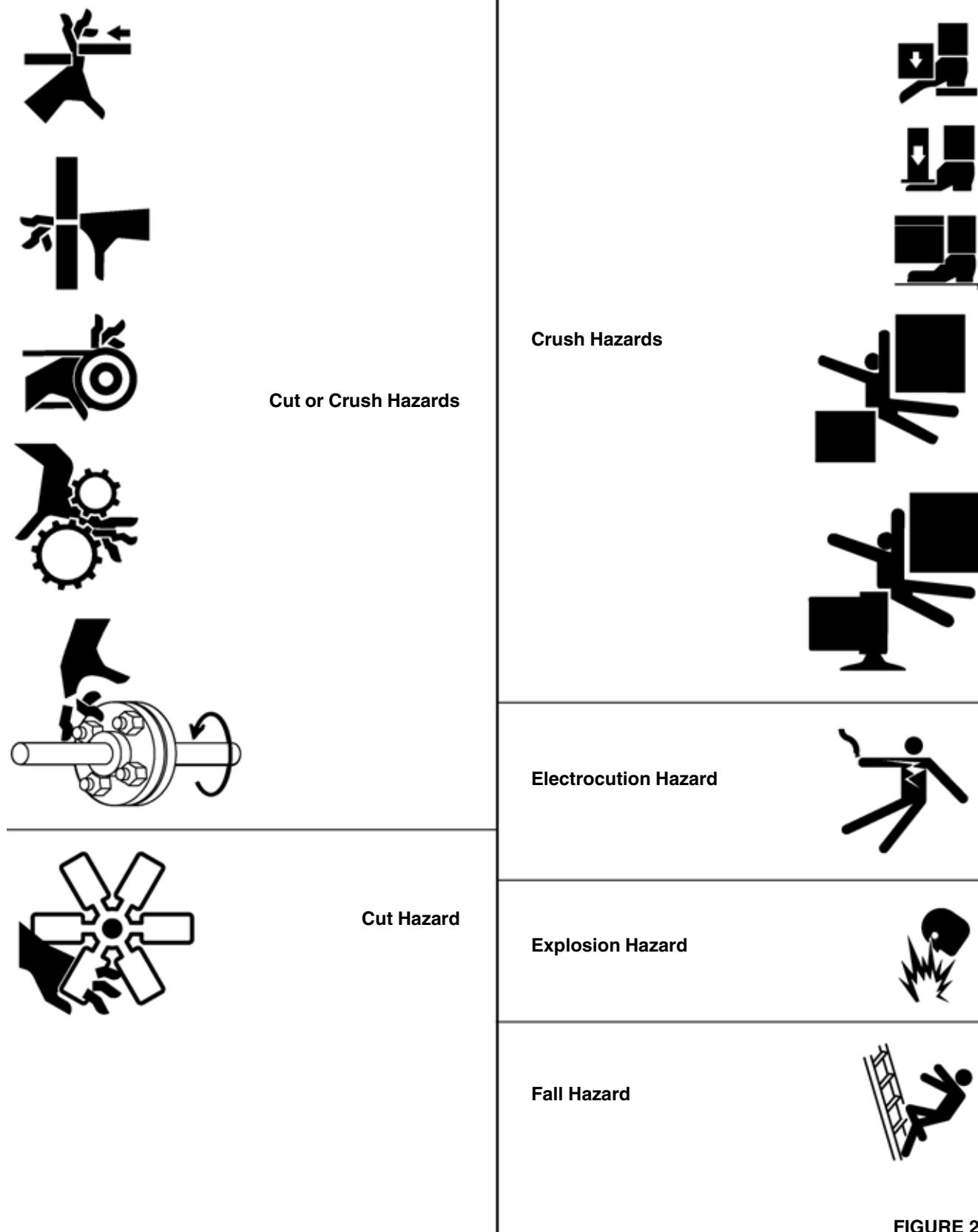


FIGURE 2-1



Fall Hazards

Falling Boom Hazards
(Crush Hazard)Falling Load Hazards
(Crush Hazard)

Fire Extinguisher

Engine Coolant

Engine Coolant Vent

Engine Oil Level

Pump Drive Oil Level

Diesel Fuel

Diesel Fuel

Hydraulic Filter

Hydraulic Filter

Hydraulic Oil

Hydraulic Oil

Fluid Symbols

2

Flying Object Hazards



Overhead Obstruction Hazard

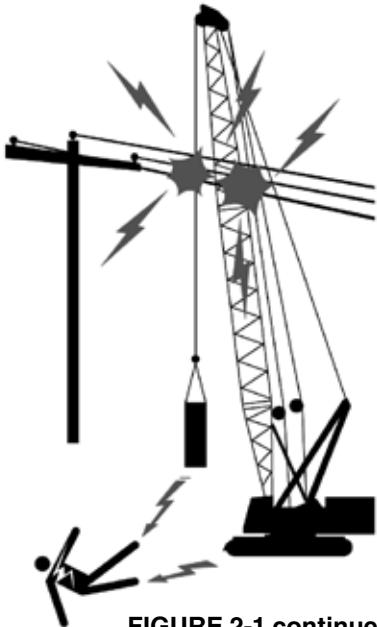
Power Line Hazard
(Electrocution)

FIGURE 2-1 continued

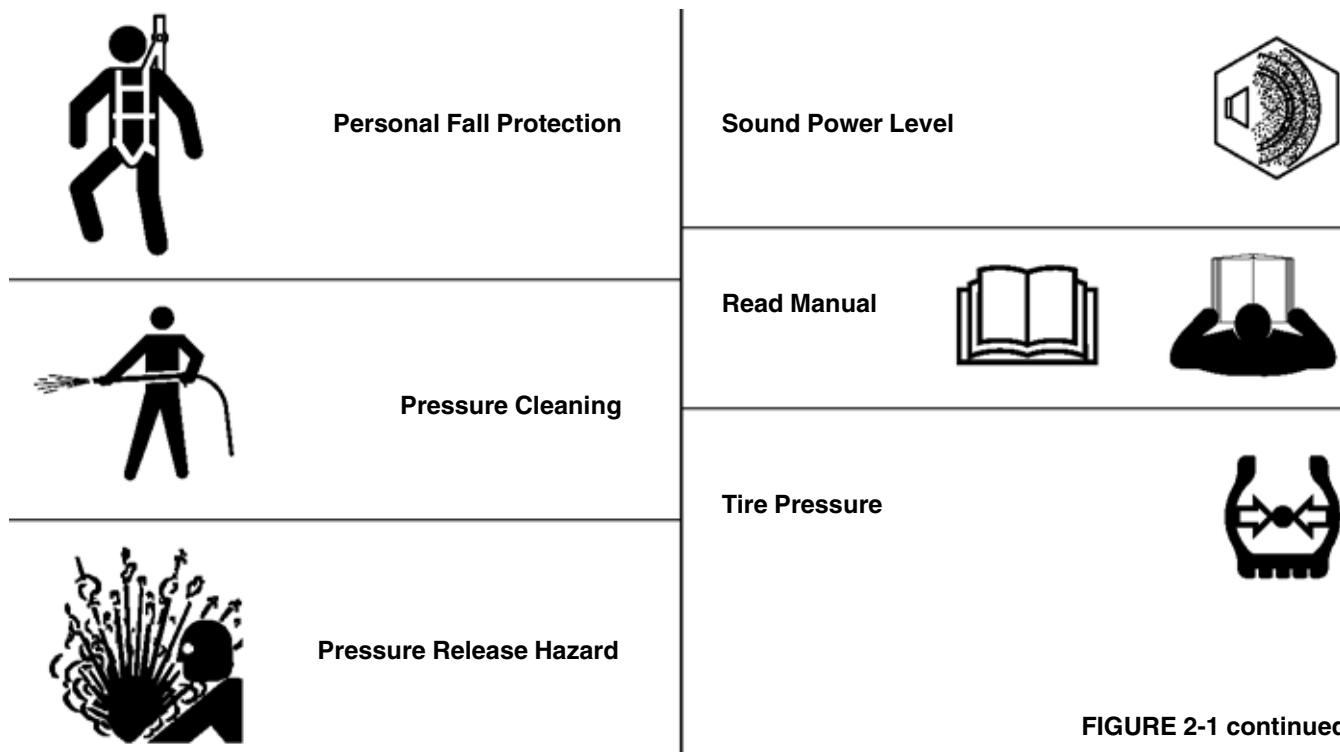


FIGURE 2-1 continued

LUFFING JIB ATTACHMENT ACCESS POINTS



DANGER

Crushing Injury Hazard!

Upperworks can swing into and crush personnel climbing on or off crane.

Moving crawlers can crush personnel climbing on or off crane.

To prevent death or serious injury:

Barricade all accessible areas to crane so personnel cannot be struck or crushed when upperworks is swung.

- Do not climb on or off crane while upperworks is being swung or crane is being traveled.
- Signal operator that you need to climb on or off crane.
- Operator: do not swing or travel while personnel are climbing on or off crane. Stop swing and travel motions. Apply swing brake and turn on travel park.
- Operator: Always sound horn to alert personnel before you swing or travel.

General

Take necessary precautions to prevent slipping and/or falling off the crane during assembly, disassembly, maintenance, or other work. **Falling from any height could result in serious injury or death.**

Manitowoc has provided steps, ladders, catwalks, and platforms at the locations shown in Figure 2-2.

The owner/user must provide workers with approved ladders or aerial work platform to access those areas of the crane that cannot be reached from the ground or from steps, ladders, catwalks, and platforms provided by Manitowoc.

Adhere to local, state, and federal regulations for handling personnel and for personnel fall protection.

- Access points must be kept clear to prevent personal injury and unsafe operation of crane. Store clothing and other personal belongings so they do not interfere with controls in operator's cab or with operation of crane.
- Tools, oil cans, spare parts, and other necessary equipment must be stored in tool boxes or other appropriate locations. Do not allow these items to lie around loose in operators cab or on steps, ladders, catwalks, and platforms.

• To reduce the risk of slipping, non-skid material (sand in paint) has been applied to painted walkways and platforms. However, walkways and platforms can be slippery when wet and when oil or grease is spilled on them. **Keep walkways and platforms clean and dry to prevent slipping on them.** When non-skid material wears out, reapply it.

- Wear shoes with a highly slip-resistant sole material. Clean any mud or debris from shoes before entering the crane cab or climbing onto the crane. A shoe that is not clean might slip off a control pedal during operation.
- Do not make modifications or additions to the crane's access system that have not been evaluated and approved by Manitowoc.
- Do not use top of mast, boom, or jib as walkways (unless they have optional catwalks).

NOTE: Optional walkways (catwalks) are available for the boom and luffing jib sections, but only for those countries that authorize their use.

Two ladders, stored in insert next to boom butt, are available for boom assembly and disassembly. See Boom Ladder Assembly in Section 4 of crane Operator's Manual for instructions.

Getting On or Off Crane

Personnel getting on and off the crane shall do so only at the steps provided and only **while crane is parked.**

Never climb onto or off a moving crane. **Climb onto and off crane only when it is parked and only with operator's permission.**

When personnel use ladders to get on or off the crane, their hands shall be free of any objects. Objects which cannot be carried in pockets or tool belts shall be lifted into place with a hand line or hoist.

Personnel Fall-Protection Anchors

Manitowoc has provided fourteen anchors on the upperworks (Figure 2-2) to which workers can attach their personnel fall-protection equipment.

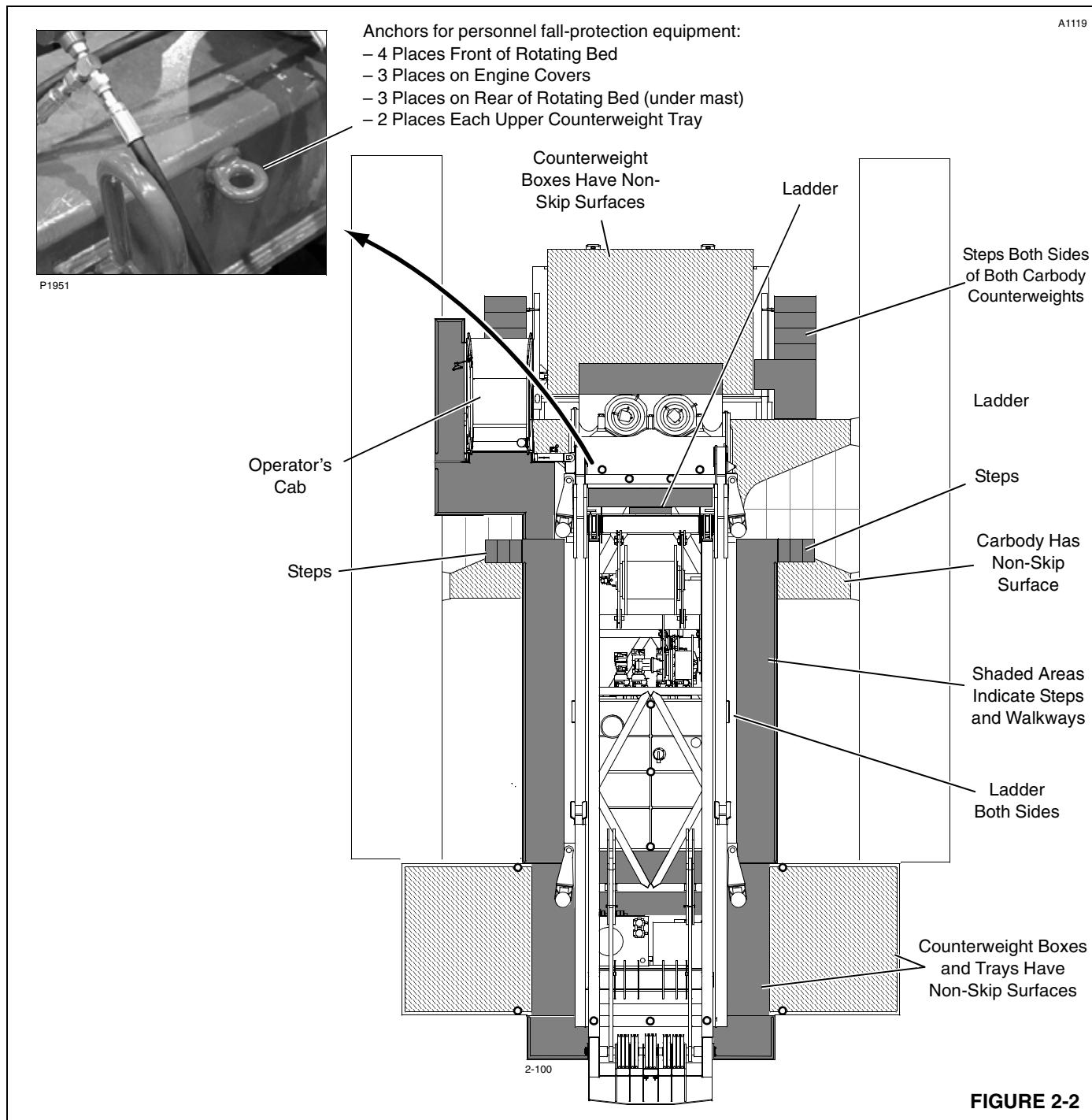


WARNING

Fall Hazard!

Anchors are designed to handle only one person at a time.

Dot use anchors for lifting or pulling loads.



OPERATOR'S MANUAL/CAPACITY CHART STORAGE

General

Manitowoc provides the following manuals and other important literature with your crane and attachment (Luffing Jib, etc.):

- Operator's Manual (Serial Numbered)
Contains safety information, crane specifications, assembly/erection procedures, operating instructions, lubrication and maintenance checks.
- Parts Manual (Serial Numbered)
Contains illustrations and part numbers of replaceable parts.
- Capacity Chart Manual (Serial Numbered)
Contains lifting capacities and related information (wire rope specifications, drum and lagging information, etc.)
- Maintenance Checks and Lube Guide
Contains lists of maintenance checks and lube services and their prescribed intervals.
- Rated Capacity Indicator/Limiter Operation
Contains Load capacity operation and calibration procedures.
- Service Manual (Serial Numbered)
Contains theory of operation, maintenance procedures, troubleshooting information, and shop procedures.
- Vendor Instructions Manual (Serial Numbered)
Contains OEM instructions for servicing purchased components, (engines, pumps, valves, etc.).

The manuals which must be retained in the operator's cab (Operator's Manual, Capacity Charts, Maintenance Checks and Lube Guide, and RCL Operation) are supplied in a OPERATOR INFORMATION binder. A separate binder is provided for the crane and each applicable attachment.

The Operator's Manuals and Capacity Charts are stamped with the serial number of the crane or attachment. The serial number on the manuals and capacity charts must match the serial number of the crane and attachment in use. ***Using any other manual or capacity chart is prohibited.***

- The crane model and serial number is located on the Crane Identification Label on the crane cab.
- The model and serial number of the attachment (other than standard boom) is located on the Crane Identification Label on the attachment.

If the serial numbers of your manuals and capacity charts do not match the serial numbers of the crane or attachment, contact your Manitowoc Crane Care distributor for the proper manual or capacity charts.

Do not operate crane or attachment if proper Capacity Chart is not in cab.

Storing Manuals

Store the Operator Information Manuals for the crane and each applicable attachment on the bookshelf in the Operator's cab (Figure 2-3).

Attach the chain from the manual in use to the link behind the operator's seat.

Keep all other manuals provided with the crane in the crane owner's/user's office so they are readily available when needed.

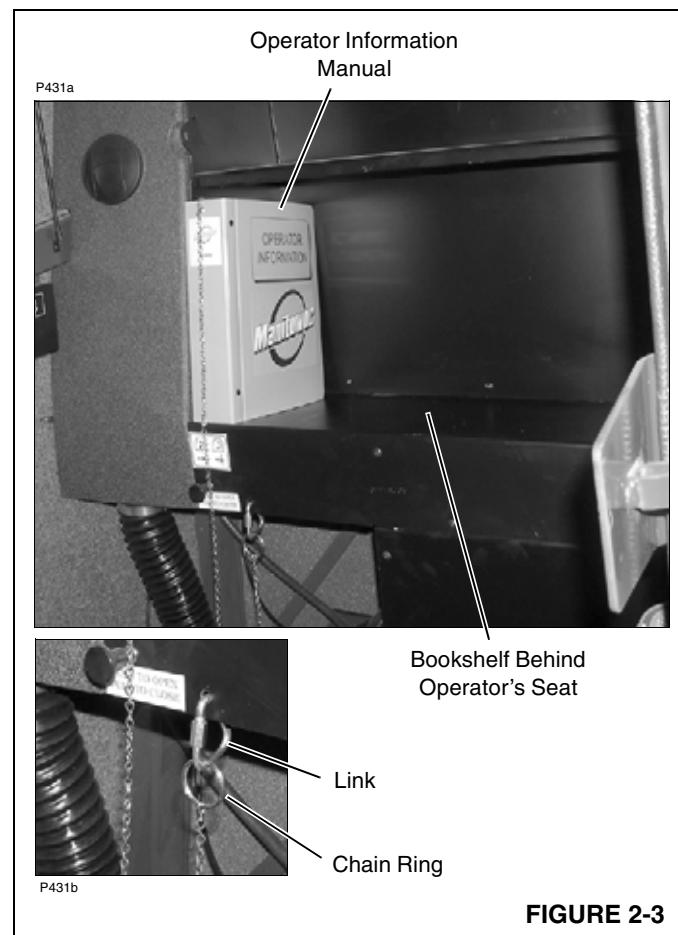


FIGURE 2-3

SAFE OPERATING PRACTICES

General

The importance of safe operation cannot be over emphasized. Carelessness and neglect on the part of operators, supervisors and planners, rigging personnel and job site personnel can result in their death or injury and costly damage to the crane or property.

The safety information in this publication is intended only as a guide to assist qualified operators in safe operation. Manitowoc cannot foresee all hazards that will arise in the field; therefore, **safety remains responsibility of crane operators and owner.**

Local, state, and other governmental agencies may require stricter operating practices. When a conflict in practices exists, follow the strictest practice.

Read Operator's Manual

Safe and efficient operation of this crane requires that it be maintained in proper working order and that its operators and maintenance personnel be familiar with the crane's functions and capabilities.

The Operator's Manual supplied with and considered part of your crane must be read and completely understood by each person responsible for operation and maintenance of the crane.

The Operator's Manual must be read to personnel who can not read or understand English or other language the manual is translated into.

Because of a program of continuing improvement in product design, Manitowoc reserves the right to change the information and specifications contained in the Operator's Manual at any time without notice. If you have any questions regarding the crane or its Operator's Manual, please contact your Manitowoc Crane Care distributor.

Operator Qualifications

The crane shall be operated only by the following **qualified** personnel:

1. Designated operators.
2. Trainees under direct supervision of a designated operator.
3. Supervisors, inspectors and maintenance or test personnel when necessary in performance of their duties. Operation of the crane by these personnel shall be limited to the crane functions needed to perform the inspection or to verify the crane's performance after maintenance procedures.

No personnel shall be allowed to climb onto the crane or enter the crane cab unless performance of

their duties require them to do so, and then only with knowledge of the operator or other qualified person.

Qualified person is defined as one who by reason of training and experience is thoroughly familiar with crane operations and the hazards involved. Such a person shall meet the operator qualifications specified in OSHA Regulations (United States Federal Law), in ASME B30.5 American Nation Standard, or in any other applicable federal, state, or local laws.

Operator training and qualification is crane owner's responsibility.

NOTE: The regulations and standards mentioned above and latter in this section can be obtained from:

US DOL/OSHA Rules and Regulations are available by mail from the Superintendent of Documents, PO Box 371954, Pittsburgh, PA, 15250-7954 or by:

- Phone 202-512-1899
- Fax 202-512-2250
- Electronically via GPO Access at docs or from www.osha.gov.

ASME (formerly ANSI) B30 Series American National Standards are available by mail from the ASME, 22 Law Drive, Fairfield, New Jersey, 0700-2900 or by:

- Phone US & Canada 800-843-2763
- Phone Mexico 95-800-843-2763
- Phone Universal 973-882-1167
- Fax 973-882-1717 or 973-882-5155
- E-mail infocentral@asme.org.

Operator Conduct

1. Operator shall not engage in any practice which diverts his/her attention while operating crane.
2. Operator shall not operate crane when physically or mentally unfit.
3. Operator shall be responsible for all operations under his/her direct control. When safety of an operation is in doubt, operator shall consult with person supervising lift before lifting load.
4. Operator shall be thoroughly familiar with operation of crane and its proper care. If adjustments or repairs are necessary or if there are known defects that impair safe operation, crane shall not be operated until unsafe conditions have been corrected.

5. If there is a warning sign at start controls, operator shall not start engine until warning sign has been removed by person who installed it.
6. Before starting engine, operator shall make sure that:
 - a. All daily inspection and maintenance services have been performed.
 - b. All controls are in off position and all brakes and locking devices are applied or engaged.
 - c. All personnel are clear of crane. Deploy a swing radius barrier.
7. Operator shall test all controls, limits, and communication systems at start of each shift. Any defects found shall be corrected before operation is begun.



WARNING

Operational aids (accessories) such as rated capacity indicator or limiter, boom and jib angle indicator or limiter, anti-two-block device, level indicator, swing limiter, proximity device, etc., may be installed on your crane. Such devices are to be used only as **AIDS TO ASSIST OPERATOR**; their presence on crane in no way substitutes for or lessens requirement that operator knowledge, experience, and judgment are required to ensure safe operation of crane.

Crane shall not be loaded beyond applicable static or dynamic ratings given on capacity chart for crane.

- See Size of Load later in this section.
 - See Section 3 of this manual and Operation Aids topic in this section for purpose of each operational aid.
8. Operator shall not start crane movement if the load or designated signal person is not within his/her range of vision or communication.
 9. Operator shall understand and respond to signals from the person directing the lift or from the designated signal person. When a signal person or crane follower is not required, operator is responsible for lift. **Operator shall obey a stop signal at all times, no matter who gives it.**
 10. Operator shall verify that the capacity chart being used is the correct one for how the crane is equipped (boom length, load line reeving, counterweight, etc.).
 11. Operator shall verify that:
 - a. All attachments are properly assembled and attached to the crane according to the rigging drawings called for on the capacity chart.

- b. The counterweight — to include applicable auxiliary counterweight — is in place and of proper weight. **Maximum required counterweight shall not be exceeded.**

12. Operator shall perform the following operations before leaving operator's cab for any reason:
 - a. Park crane (if mobile) and position upperworks so the crane does not interfere with operation of other equipment.
 - b. Apply travel and swing brakes or locking devices.
 - c. Land any attached load.
 - d. Lower boom onto blocking at ground level or onto a boom rest if possible; otherwise, securely fasten boom from movement by wind or other outside forces.
 - e. Move all controls to off.
 - f. Apply all drum brakes and pawls.
 - g. Disengage master clutch, if equipped.
 - h. Stop engine.
13. Operator shall perform following operations if power or a control function fails during operation:
 - a. Land all suspended loads, if possible, under brake or power control.
 - b. Apply all brakes and locking devices.
 - c. Move all controls to off.
14. If crane will be operated at night, operator shall make sure that there is sufficient lighting for safe operation. Load and landing area shall be illuminated.
15. Operator shall not operate crane during periods of bad weather if his or her ability to see load or signal person is impaired by darkness, fog, rain, snow, etc.
Never operate crane during an electrical thunderstorm.
When a local weather storm warning exists, Manitowoc recommends that operation be stopped and the crane secured. See step 12 under Operator Conduct topic.

NOTE: DO NOT depend on grounding. Grounding of a crane affords little or no protection from electrical hazards. The effectiveness of grounding is limited by size of conductor (wire) used, condition of ground, magnitude of voltage and current present, and numerous other factors.

16. Wind can cause crane to tip or boom and other attachments to collapse. Operator or qualified person directing lift shall compensate for effect of wind on load

and boom by reducing ratings, reducing operating speeds, or a combination of both.

Unless otherwise specified on Capacity Chart, or in Operator's Manual, stop operation under following wind conditions:

- a. If wind causes load to swing forward past allowable operating radius or sideways past either boom hinge pin, land load and apply drum brakes.
- b. If wind exceeds 35 mph, land all loads and apply drum brakes, lower boom onto blocking at ground level or otherwise restrain it, and apply swing and travel brakes and/or locks.
17. Booms, jibs, or masts which are being assembled or disassembled on ground (with or without support of boom rigging) shall be securely blocked to prevent dropping of boom, jib, or mast sections.
18. Each outrigger shall be visible to operator or signal person during extension and retraction.

Handling Load

Size of Load

1. Crane shall not be loaded beyond applicable static or dynamic ratings given on the capacity chart for the crane configuration.

NOTE: Capacity charts for Manitowoc cranes show the total weight of freely suspended loads for various boom and jib lengths and operating radii.

To determine actual weight of load which can be lifted at a given radius (working load), operator must deduct weight of certain lifting equipment from total weight given on chart. See specific capacity chart for your crane for a list of lifting equipment which must be deducted.

Operator's judgment must be used to further reduce total weight to allow for dynamic effects of swinging, hoisting, or lowering, and adverse weather conditions to include wind.

2. Operator or other designated person directing the lift shall verify that weight of load is within static or dynamic rating for radius at which load will be lifted.

Verified weights and measured radii shall take priority over RCI/RCL readings.

Attaching Load

1. Attach hook to load with slings, or other suitable rigging. Each hook shall have a latch that is in proper working order. **Hook latches shall not be wired open.**
 - a. Inspect each hook and latch before using.
 - b. Never use a hook or latch that is distorted or bent.
 - c. Make sure spring will force latch against tip of hook.
 - d. Make sure hook supports load. Latch must never support load. Latches are only intended to retain loose slings under slack conditions.
2. Only use slings and other rigging that are in safe operating condition and have a rating equal to or greater than the load to be lifted.
3. Do not wrap load line around load.
4. Use suitable protection between slings and any sharp edges on load.
5. Secure unused legs of a multi-leg sling before handling a load with one leg of sling.

Lifting/Moving Load

1. Before lifting or moving load, operator or qualified person directing lift shall make following checks:
 - a. Crane has a firm uniformly supporting foundation under both crawlers, all tires, or each outrigger jack pad or float. Unless otherwise specified on capacity chart, foundation shall be *level to within 1% — 1 ft (0,3 m) rise or fall in 100 ft (30,5 m) distance.* When such a surface is not available, it shall be provided with timbers, cribbing, or other structural members to distribute load such that allowable bearing capacity of underlying member is not exceeded. *Contact Manitowoc Crane Care Customer Service at Manitowoc for ground bearing data.*
 - b. Load is secured and properly balanced in slings or lifting device before lifting the load more than 3 – 6 in (76 – 152 mm).
 - c. Lift and swing paths are clear of personnel and obstructions.
 - d. Load is free to be lifted.
 - e. Load line is not kinked or otherwise damaged.
 - f. Multiple part load lines are not twisted around each other in such a manner that lines will not separate when load is lifted.
 - g. Hook is brought over load in a manner that will minimize twisting or swinging.

- h. Load line and boom hoist ropes are properly spooled on drums and seated in sheaves.
 - i. Load drum brakes are in proper working order.
Operator shall test load drum brakes each time a load approaching rated load is handled. Lift load 3 – 6 in (76 – 152 mm) and fully apply brakes — *load must not lower through applied brakes*.
 - j. Unused load drums are parked (working and parking brakes applied; if equipped, drum pawls engaged).
 - k. All personnel are clear of swing radius of crane's counterweight.
2. While lifting or moving load, operator shall take following precautions:
- a. Accelerate and decelerate load smoothly to avoid excessive stress on crane boom and machinery.
 - b. Avoid sudden starts and stops while swinging. Keep swing speed under control to prevent load from swinging out beyond radius at which load can be handled and to minimize the pendulum action of load.
 - c. Use taglines or other restraints to control load when necessary.
 - d. Do not exceed any swing limitations (areas of operation) given on capacity chart.
 - e. Do not allow load, boom, or any other part of crane to contact obstructions.
 - f. Do not use crane to drag a load.
 - g. Do not hoist, lower, or swing load while personnel are on load or hook. See Personnel Handling in this section.
 - h. Avoid carrying load over personnel. Loads which are suspended shall be blocked or cribbed before personnel are allowed to work under or between them.
 - i. Before lifting a load which requires use of outriggers (or anytime outriggers are used), fully extend outrigger beams and jacks so the truck tires do not bear any load.
Securely fasten outrigger jack pads or floats to jacks and set them on a flat, firm surface that will support load placed on pads or floats. Do not set jack pads or floats in holes, on rocky ground, or on extremely soft ground.
When dictated by ground conditions, install wood blocking or steel plates under jack pads or floats to properly distribute loading on the supporting surface.
- Wood blocking or steel plates used under jack pads or floats shall be:
- Free of defects.
 - Strong enough to prevent crushing, bending, or shear failure.
 - Of sufficient thickness, width, and length to completely support the jack pad or float, transmit the load to the supporting surface, and prevent shifting, toppling, or excessive settlement under load.
- j. Fully retract and lock jacks and outrigger beams so they cannot extend when not in use.
- k. Operate with extreme caution when using two or more cranes to lift same load.
One designated person shall be responsible for operation when two or more cranes are used to lift same load. Designated person shall analyze lift and instruct all personnel involved in proper rigging and positioning of load and all movements to be made. Decisions such as necessity to reduce crane ratings, load position, boom position, ground support, and speed of movements shall be in accordance with designated person's decision.
- I. Do not lower load or boom to a point where less than two full wraps of wire rope remain on the respective drum (or as otherwise indicated in local, state, or federal regulations).
- m. Engage boom hoist pawl when operating with boom at a fixed radius.
3. While traveling, operator shall take following precautions:
- a. Sound signal horn before traveling and intermittently while traveling, especially when approaching personnel.
 - b. Carry boom in-line with lowerworks and facing direction of travel.
 - c. Do not position boom so high that it could bounce over backwards whether traveling with or without load.
 - d. Lock upperworks against rotation except when it is necessary to negotiate a turn, and then only when operator is seated at controls or the boom is supported on a dolly.
 - e. Lash or otherwise restrain unused hooks so they cannot swing freely.
4. Before traveling with a load, operator shall take following additional precautions:

- a. A designated person shall be responsible for operation. Decisions such as necessity to reduce crane ratings, load position, boom position, ground support, and speed of movements shall be in accordance with designated person's decision.
- b. Maintain specified tire pressures (truck cranes).
- c. Avoid sudden starts and stops. Use taglines or other restraints to control position of load.

Multiple Load Line Operation

Multiple load line operation is becoming common practice for applications like panel tilt-up, pile tilt-up, pile driving, rolling fabricated sections, etc. The multiple lines may be on a common shaft (each with different parts of line) or on multiple shafts (boom and upper point, boom and fixed jib point, etc.).

Manitowoc authorizes multiple load line operation for those applications requiring it, provided following steps are performed:

1. A qualified lift planner and crane operator shall read and become thoroughly familiar with appropriate Capacity Charts and Wire Rope Specification Charts.
 2. Lift planner and crane operator shall make sure total load does not exceed rated capacity given in Capacity Chart and Wire Rope Specification Chart for given boom point or jib point.
- EXAMPLE: If one of load line is lifting from jib point, proper jib chart applies.
3. Crane shall be thoroughly inspected by a qualified person prior to setup.
 4. Crane shall be thoroughly inspected for load line interference caused by routing and reeving of multiple load lines. If interference is found, it shall be eliminated.
 5. For cranes produced before 2003, Rated Capacity Indicators/Limiters were not required by ASME B30.5 for non-personnel lifting.

To aid operator in staying within crane's capacity chart with total applied load, Manitowoc recommends that its cranes be equipped with Rated Capacity Indicators/Limiters to monitor load on each load line.

Operator is still responsible knowing load and radius whether or not crane is equipped with load indicator(s).

6. Manitowoc also recommends that each load line be equipped with an anti two-block device.
7. Manitowoc's Capacity Charts are based on freely suspended loads. To prevent side load damage to boom, jib, and sheaves:
 - Load lines must hang as near vertical as possible to minimize side and forward loads.

- Load must remain centered on boom and jib point shafts unless special lift approval is granted by Manitowoc.
 - Load lines should be located over load's center of gravity as it is supported on a trailer, barge, or ground.
8. Crane operator must be familiar with operational characteristic of crane as it relates to multiple drum operation (simultaneous operation, same or opposite direction, or individual operation).
 9. When using tandem drums, maximum operating layers may be limited depending on whether crane was initially designed for tandem drum operation or not.



WARNING

Avoid Over Load and Side Load Damage to Crane

Manitowoc highly recommends that you contact your Manitowoc Crane Care distributor for lift planning assistance and approval.

Holding Load

When a load is suspended, operator shall take following precautions:

1. Not leave his/her position at controls.
2. Not allow personnel to stand or pass under load.
3. Move all controls to off, apply all drum brakes, engage boom hoist pawl, and apply swing and travel brakes or locks.

Signals

1. Continuous communication shall be maintained between operator and signal person during all crane movements. If communication is disrupted, **operator shall stop all crane movements.**
2. Signals to operator shall be in accordance with standard signals shown in Section 3, unless communications equipment (telephone, radio, etc.) is used.
3. All signals shall be easily understood by operator at all times. Operator shall not respond to any signal which is not clearly understood.
4. For operations not covered in standard signals, or for special situations or emergencies, additional signals may be required. In those cases, signals used shall be agreed upon in advance by operator and signal person. Signals used shall not conflict with or have potential to be confused with standard signals.

5. When it is necessary to give instructions to operator (other than those established by signal system), all crane motions shall be stopped.
6. Signal person shall:
 - a. Be tested by a designated person and show that he or she has a basic understanding of crane operations and limitations and is thoroughly familiar with the standard hand signals and voice signals if used.
 - b. Be positioned in clear view of operator. Signal person's position should give him or her a clear view of load, crane, and operating area.
 - c. Direct load so it does not pass over personnel.
 - d. Keep unnecessary personnel out of crane's operating area.
7. When moving crane, following audible signals shall be used:
 - a. STOP - one short audible signal.
 - b. GO AHEAD - two short audible signals.
 - c. BACK UP - three short audible signals.

Operational Aids

Verified weights, measured radii, and Manitowoc's Capacity Charts and instructions shall take precedence over operational aids when handling a load. If it is necessary to temporarily override an operational aid, crane user shall stay within limits of Manitowoc's Capacity Charts and instructions. A designated, qualified person responsible for directing the lift shall make sure load does not exceed capacity chart.

When operational aids are inoperative or malfunctioning, the following steps shall be taken to ensure safe continued operation of the crane.

1. Steps shall be taken to schedule repairs and calibration immediately. Operational aids shall be put back into service as soon as replacement parts, if required, are available and repairs and calibration can be carried out. Every reasonable effort must be made to expedite repairs and calibration.
2. When **rated capacity indicator/limiter** is inoperative or malfunctioning, designated, qualified person directing lift shall establish procedures for determining load weights and shall make sure that weight of load does not exceed crane rating at radius where load is handled.
3. When **boom angle or radius indicator** is inoperative or malfunctioning, radius or boom angle shall be determined by measurement (i.e., measure radius with tape measure; measure boom angle with a protractor-level on centerline of boom).

4. When **boom or jib angle limiter (automatic boom or jib stop)** is inoperative or malfunctioning, qualified person directing lift shall make sure maximum boom angle/radius specified on capacity chart for load being handled is not exceeded. Radius and boom angle shall be determined by measurement (i.e., measure radius with tape measure; measure angle with a protractor-level on centerline of boom).
5. When **anti-two-block device** is inoperative or malfunctioning, qualified person directing lift shall establish procedures to furnish equivalent protection (i.e., assign an additional signal person to observe distance between load and boom or jib point). This practice does not apply when lifting personnel in load line supported baskets. **Personnel shall not be lifted in load line supported baskets when anti-two-block devices are not functioning properly.**
6. When **level indicator** is inoperative or malfunctioning, other means shall be used to level crane within limits specified on capacity chart (i.e., level crane using a carpenter level on rotating bed).
7. When **boom length indicator** is inoperative or malfunctioning, qualified person directing lift shall establish boom length at which lift will be made by actual measurement and marking of boom.
8. When **swing limiter** or other **proximity device** is inoperative or malfunctioning, qualified person directing lift shall establish procedures to furnish equivalent protection (i.e., assign an additional signal person to observe distance between boom or load and job site obstructions to include power lines).
9. When **drum spooling limiter** (maximum or minimum bail limit) is inoperative or malfunctioning, qualified person directing lift, operator, or designated signal person shall watch drum and make sure it is not over spooled (rope does not jump off drum) and that there are never less than 2 full wraps of wire rope on load drum or boom hoist (or as otherwise indicated in local, state, or federal regulations).

OPERATING NEAR ELECTRIC POWER LINES AND TRANSMISSION LINES

Electrocution Hazard

Thoroughly read, understand, and abide by all applicable federal, state, and local regulations regarding operation of cranes near electric power lines or equipment.

United States federal law prohibits the use of cranes closer than 10 ft (3 m) to power sources up to 50,000 volts, and greater distances for higher voltages [29CFR1910.180 and 29CFR1926.550].



To avoid death or serious injury, Manitowoc recommends that all parts of crane, boom, and load be kept at least 20 ft (6 m) away from all electrical power lines and equipment.

NOTE: For detailed guidelines on operating near power lines, refer to current edition of ASME B30.5 American National Standard.

Keep all personnel and their personal belongings (clothing, water coolers, lunch buckets, etc.) away from crane if it is being operated near electrical power lines or equipment.

Before operating crane in the vicinity of electrical power lines or equipment, notify the power utility company. Obtain positive and absolute assurance that the power has been turned off.

The crane is NOT INSULATED. Always consider all parts of the load and the crane, including the wire rope, pendants or straps, and tag lines as conductors.

Most overhead power lines ARE NOT insulated. Treat all overhead power lines as being energized unless you have reliable information to the contrary from the utility company or owner.

The rules in this section must be followed at all times, even if the electrical power lines or equipment have been de-energized.

Crane operation is dangerous when close to an energized electrical power source. Exercise extreme caution and prudent judgement. Operate slowly and cautiously when in the vicinity of power lines.

If the load, wire rope, boom, or any portion of the crane contacts or comes too close to an electrical power source, everyone in, on, and around the crane can be seriously injured or killed.

The safest way to avoid electrocution is to stay away from electrical power lines and electrical power sources.

The operator is responsible for alerting all personnel of dangers associated with electrical power lines and equipment. The crane is not insulated. Do not allow unnecessary personnel in the vicinity of the crane while operating. Permit no one to lean against or touch the crane. Permit no one, including riggers and load handlers, to hold the load, load lines, tag lines, or rigging gear.

Even if the crane operator is not affected by an electrical contact, others in the area may become seriously injured or killed.

It is not always necessary to contact a power line or power source to become electrocuted. Electricity, depending on magnitude, can arc or jump to any part of the load, load line, or crane boom if it comes too close to an electrical power source. Low voltages can also be dangerous.

Set-Up and Operation

During crane use, assume that every line is energized ("hot" or "live") and take necessary precautions.

Position the crane such that the load, boom, or any part of the crane and its attachments cannot be moved to within 20 ft (6 m) of electrical power lines or equipment. This includes the crane boom and all attachments. Overhead lines tend to blow in the wind so allow for lines' movement when determining safe operating distance.

A suitable barricade should be erected to physically restrain the crane, all attachments, and the load from entering into an unsafe distance from electrical power lines or equipment.

Plan ahead and always plan a safe route before traveling under power lines. Rider poles should be erected on each side of a crossing to assure sufficient clearance is maintained.

Appoint a reliable and qualified signal person, equipped with a loud signal whistle or horn and voice communication equipment, to warn the operator when any part of the crane or load moves near a power source. This person should have no other duties while the crane is working.

Tag lines should always be made of non-conductive materials. Any tag line that is wet or dirty can conduct electricity.

DO NOT store materials under power lines or close to electrical power sources.

Prior to operating near transmitter towers where an electrical charge can be induced into the crane or load:

- The transmitter shall be deenergized OR,
- Tests shall be made to determine if an electrical charge will be induced into the crane or load.

Every precaution shall be taken to dissipate induced voltages. Consult local, state, and federal codes and regulations.

Electrocution Hazard Devices

The use of insulated links, insulated boom cages/guards, proximity warning devices, or mechanical limit stops does not assure that electrical contact will not occur. Even if codes or regulations require the use of such devices, failure to follow the rules in this section may result in serious injury or death.

Be aware that such devices have limitations and you should follow the rules and precautions outlined in this section at all times even if the crane is equipped with these devices.

Insulating links installed into the load line afford limited protection from electrocution hazards. Links are limited in their lifting abilities, insulating properties, and other properties that affect their performance. Moisture, dust, dirt,

oils, and other contaminants can cause a link to conduct electricity. Due to their capacity ratings, some links are not effective for large cranes and/or high voltages/currents.

The only protection that may be afforded by an insulated link is below the link (electrically downstream), provided the link has been kept clean, free of contamination, has not been scratched or damaged, and is periodically tested (just before use) for its dielectric integrity.

Boom cages and boom guards afford limited protection from electrocution hazards. They are designed to cover only the boom nose and a small portion of the boom. Performance of boom cages and boom guards is limited by their physical size, insulating characteristics, and operating environment (e.g. dust, dirt, moisture, etc.). The insulating characteristics of these devices can be compromised if not kept clean, free of contamination, and undamaged.

Proximity sensing and warning devices are available in different types. Some use boom nose (localized) sensors and others use full boom length sensors. No warning may be given for components, cables, loads, and other attachments located outside of the sensing area. Reliance is placed upon the operator in selecting and properly setting the sensitivity of these devices.

Never rely solely on a device to protect you and your fellow workers from danger.

Some variables you must know and understand are:

- Proximity devices are supposed to detect the existence of electricity and not its distance, quantity, or magnitude.
- Some proximity devices will detect only alternating current (AC) and not direct current (DC).
- Some proximity devices detect radio frequency (RF) energy and others do not.
- Most proximity devices simply provide a signal (audible, visual, or both) for the operator and this signal must not be ignored.
- Sometimes the sensing portion of the proximity devices becomes confused by complex or differing arrays of power lines and power sources.

DO NOT depend on grounding. Grounding of a crane affords little or no protection from electrical hazards. The effectiveness of grounding is limited by the size of the (wire) conductor used, the condition of the ground, the magnitude of the voltage and current present, and numerous other factors.

Electrical Contact

If the crane comes in contact with an energized power source, the operator must:

1. Stay in the crane cab. DON'T PANIC.
2. Immediately warn PERSONNEL in the vicinity to STAY AWAY.
3. Attempt to move the crane away from the contacted power source using the crane's controls which are likely to remain functional.
4. Stay in the crane until the power company has been contacted and the power source has been de-energized. NO ONE must attempt to come close to the crane or load until the power has been turned off.

Only as a last resort should an operator attempt to leave the crane upon contacting a power source. If it is absolutely necessary to leave the cab, JUMP COMPLETELY CLEAR OF CRANE. DO NOT STEP OFF. Hop away with both feet together. DO NOT walk or run.

Following any contact with an energized electrical source, your Manitowoc Crane Care distributor must be immediately advised of the incident and consulted on necessary inspections and repairs. Thoroughly inspect the wire rope and all points of contact on the crane. Should the distributor not be immediately available, contact Crane Care Customer Service at the factory. The crane must not be returned to service until it is thoroughly inspected for any evidence of damage and all damaged parts are repaired or replaced as authorized by your Manitowoc Crane Care distributor or the factory.

REFUELING

1. When using a portable container to refuel crane, container shall be a safety-type can equipped with an automatic closing cap and a flame arrester.
2. Engine shall be **stopped** before refueling crane.
3. Smoking and open flames shall be prohibited in refueling area.

FIRE EXTINGUISHERS

1. A portable fire extinguisher with a minimum rating of 10 BC shall be installed in operator's or machinery cab of crane.
2. Operator and all maintenance personnel shall be thoroughly familiar with location, use, and care of fire extinguisher(s) provided.

ACCIDENTS

If this crane becomes involved in a property damage and/or personal injury accident, immediately contact Crane Care Customer Service or the Product Safety and Reliability Manager at the following address:



Manitowoc Cranes

2401 So. 30th St.
Manitowoc, WI 54220

Phone: 1-888-499-7278 or
Fax: 920-683-6390

Provide a complete description of the accident, including the crane model and serial number.

SAFE MAINTENANCE PRACTICES



WARNING

Importance of safe maintenance cannot be over emphasized. Carelessness and neglect on part of maintenance personnel can result in their death or injury and costly damage to the crane or property.

Safety information in this publication is intended only as a guide to assist qualified maintenance personnel in safe maintenance. Manitowoc cannot foresee all hazards that will arise in field; therefore, **safety remains responsibility of maintenance personnel and crane owner.**

Maintenance Instructions

To ensure safe and proper operation of Manitowoc cranes, they must be maintained according to the instructions contained in this manual and the Service Manual provided with the crane.

Crane maintenance and repair must be performed by personnel who by reason of training and experience are thoroughly familiar with the crane's operation and required maintenance. These personnel must **read Operator's Manual and Service Manual before attempting any maintenance procedure.** If there is any question regarding maintenance procedures or specifications, contact your Manitowoc Crane Care distributor for assistance.

Training/qualification of maintenance personnel is responsibility of crane owner.

Safe Maintenance Practices

1. Perform following steps (as applicable) before starting a maintenance procedure:
 - a. Park crane where it will not interfere with other equipment or operations.
 - b. Lower all loads to ground or otherwise secure them against movement.
 - c. Lower boom onto blocking at ground level, if possible, or otherwise secure boom against dropping.

d. Move all controls to off and secure all functions against movement by applying or engaging all brakes, pawls, or other locking devices.

e. Stop engine and render starting means inoperative.

f. Place a warning sign at start controls alerting other personnel that crane is being serviced and engine must not be started. *Do not remove sign until it is safe to return crane to service.*

2. Do not attempt to maintain or repair any part of crane while engine is running, unless absolutely necessary.

If engine must be run, keep your clothing and all parts of your body away from moving parts. **Maintain constant verbal communication between person at controls and person performing maintenance or repair procedure.**

3. Wear clothing that is relatively tight and belted.

4. Wear appropriate eye protection and approved hard hat.

5. Never climb onto or off a moving crane. **Climb onto and off crane only when it is parked and only with operator's permission.**

Use *both hands* and handrails, steps and ladders provided to climb onto and off crane.

Lift tools and other equipment which cannot be carried in pockets or tool belts onto and off crane with hand lines or hoists.

6. Boom and gantry are not intended as ladders. Do not attempt to climb lattice work of boom or gantry to get to maintenance points. If boom or gantry is not equipped with an approved ladder, lower them before performing maintenance or repair procedures.

7. Do not remove cylinders until working unit has been securely restrained against movement.

8. Pinch points are impossible to eliminate; watch for them closely.

9. Pressurized air, coolant, and hydraulic oil can cause serious injury. Make sure all air, coolant, and hydraulic lines, fittings, and components are tight and serviceable.

Do not use your hands to check for air and hydraulic oil leaks:

- Use a soap and water solution to check for air leaks (apply to fittings and lines and watch for bubbles).
- Use a piece of cardboard or wood to check for hydraulic oil leaks.

10. Relieve pressure before disconnecting air, coolant, and hydraulic lines and fittings.

11. Do not remove radiator cap while coolant is hot or under pressure. Stop engine, wait until pressure drops and coolant cools, then slowly remove cap.
 12. Avoid battery explosion: do not smoke while performing battery maintenance, do not short across battery terminals to check its charge.
 13. Read safety information in battery manufacturer's instructions before attempting to charge a battery.
 14. Avoid battery acid contact with skin and eyes. If contact occurs, flush area with water and immediately consult a doctor.
 15. Stop engine before refueling crane.
 16. Do not smoke or allow open flames in refueling area.
 17. Use a safety-type can with an automatic closing cap and flame arrestor for refueling.
 18. Hydraulic oil can also be flammable. Do not smoke or allow open flames in area when filling hydraulic tanks.
 19. Never handle wire rope with bare hands. Always wear heavy-duty gloves to prevent being cut by broken wires.
 20. Use extreme care when handling coiled pendants. Stored energy can cause coiled pendants to uncoil quickly with considerable force.
 21. When inflating tires, use a tire cage, a clip-on inflator, and an extension hose which permits standing well away from tire.
 22. Only use cleaning solvents which are non-volatile and non-flammable.
 23. Do not attempt to lift heavy components by hand. Use a hoist, jacks, or blocking to lift components.
 24. Use care while welding or burning on crane. Cover all hoses and components with non-flammable shields or blankets to prevent a fire or other damage.
 25. To prevent damage to crane parts (bearings, cylinders, swivels, slewing ring, computers, etc.), perform following steps **before welding on crane**:
 - Disconnect all cables from batteries.
 - Disconnect output cables at engine junction box.
 - Attach ground cable from welder directly to part being welded and as close to weld as possible.
- Do not weld on engine or engine mounted parts (per engine manufacturer).
26. Disconnect and lock power supply switch before attempting to service high voltage electrical components and before entering tight areas (such as carbody openings) containing high voltage components.
 27. When assembling and disassembling booms, jibs, or masts on ground (with or without support of boom rigging pendants or straps), securely block each section to provide adequate support and alignment.
- Do not go under boom, jib, or mast sections while connecting bolts or pins are being removed.***
28. Unless authorized in writing by Manitowoc, do not alter crane in any way that affects crane's performance (to include welding, cutting, or burning of structural members or changing pressures and flows of air/hydraulic components). Doing so will invalidate all warranties and capacity charts and make crane owner/user liable for any resultant accidents.
 29. ***Keep crane clean.*** Accumulations of dirt, grease, oil, rags, paper, and other waste will not only interfere with safe operation and maintenance but also create a fire hazard.
 30. Store tools, oil cans, spare parts, and other necessary equipment in tool boxes. Do not allow these items to lie around loose in operator's cab or on walkways and stairs.
 31. Do not store flammable materials on crane.
 32. Do not return crane to service at completion of maintenance or repair procedures until all guards and covers have been reinstalled, trapped air has been bled from hydraulic systems, safety devices have been reactivated, and all maintenance equipment has been removed.
 33. Perform a function check to ensure proper operation at completion of maintenance or repair.

BOOM DISASSEMBLY SAFETY

NOTE: The term "boom" used in the following instructions applies to all lattice attachments (fixed jib, luffing jib, mast, etc.)



DANGER!

Collapsing Boom Hazard!

Prevent death or serious injury when disassembling boom sections — read and adhere to following instructions.

Safe handling of lattice booms during disassembly is a primary concern for preventing serious or fatal injuries. A boom can collapse during disassembly if workers fail to observe safe working practices.

Accidents during boom disassembly usually result from one of three primary causes:

- Workers are not familiar with equipment or are not properly trained.
- Disassembly area is not suitable.
- Safe procedures are overlooked because not enough time is allocated for the task.

General

Safety decals (Figure 2-4) are placed near the connectors on the boom sections as shown on the Boom Disassembly Decal Drawing at the end of this section.

Workers involved with boom disassembly must be trained and experienced in the operation and disassembly of construction cranes. Everyone must read and understand these instructions, the information in the Boom Assembly Drawing, and the instructions in Section 4 of this manual before beginning disassembly. Anyone who has a question should ask for an explanation. ***One worker who does not fully understand or fails to follow correct procedures can endanger other workers.***

Location

Select a suitable location for boom disassembly. It must be firm, level, and be free of obstructions. It should have enough open space to accommodate the crane, the length of boom, and – if required – movement of an assist crane or other equipment. If possible, secure the area to keep unauthorized personnel and vehicles away.

Pin Removal

When removing pins from boom sections, stand clear of pins being removed. Even though the boom is resting on

blocking, individual pin connections may still be under load. Pins can be ejected forcefully if the boom has any pressure on it or if the boom is not supported properly.



FIGURE 2-4

Disassembly Precaution

Always block boom sections so they are securely supported and cannot shift or move suddenly when pins are removed. If there is any doubt about a boom disassembly procedure, ***block tightly under boom sections before removing any pin.***



DANGER

Collapsing Boom Hazard!

Boom can collapse or shift violently when pins are removed. To avoid death or serious injury:

- Do not remove bottom connecting pins from any boom section when boom is supported by straps as shown in Figure 2-5, View A.
- Do not remove strap connecting pins until straps are fully lowered into supports as shown in Figure 2-5, View C.
- Do not remove bottom connecting pins from any boom section when boom point is resting on ground and handling pendants are slack as shown in Figure 2-5, View B.
- Never work or stand inside boom unless it is lowered and securely blocked as shown in Figure 2-5, View C.
- Do not stand or walk on top of boom unless it has walkways.



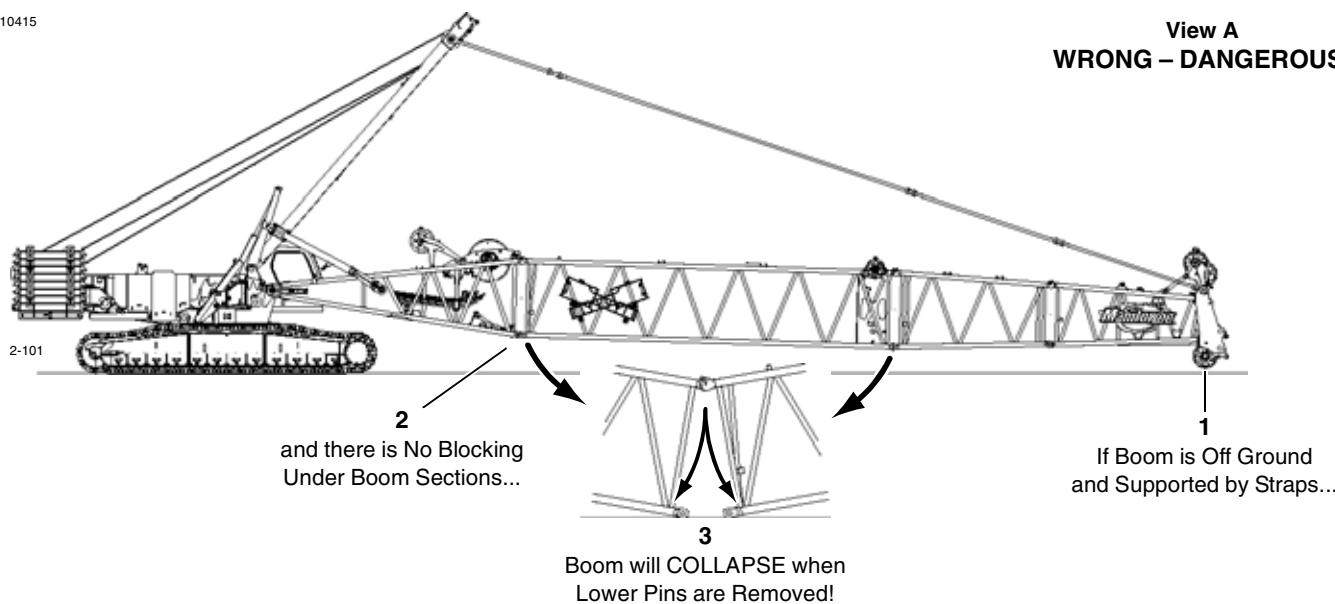
DANGER

Falling Boom Hazard!

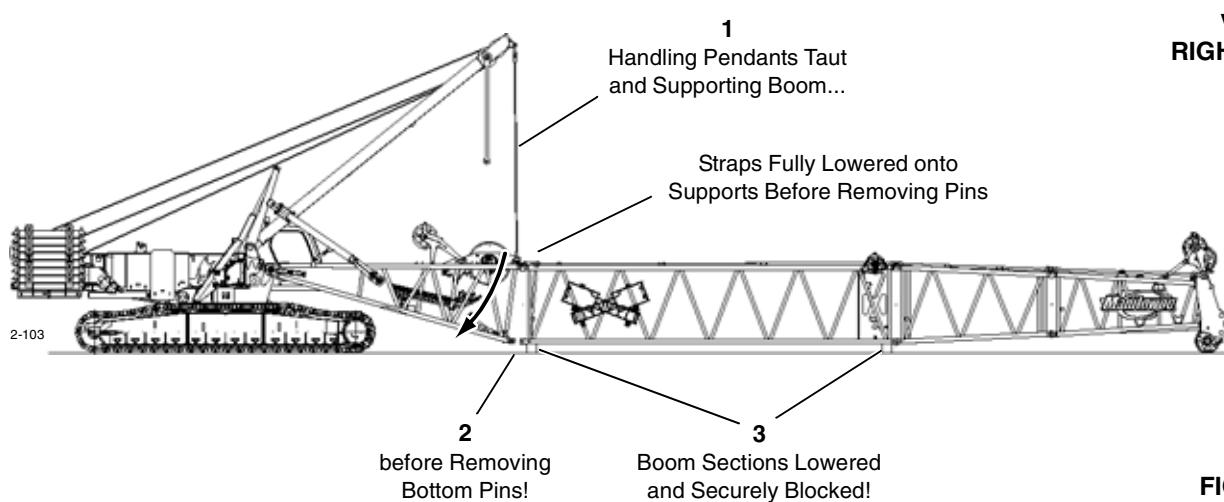
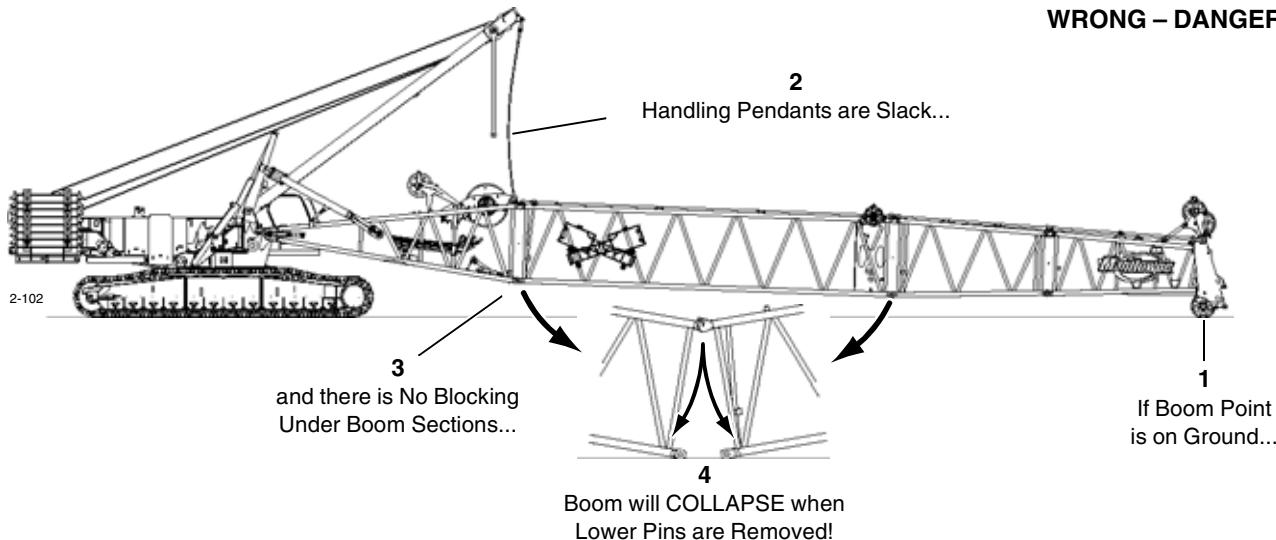
Crane can tip or boom can collapse if excess boom is cantilevered. Never cantilever more boom than allowed in rigging drawings or capacity charts.

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View A
WRONG – DANGEROUS!

**2**

View B
WRONG – DANGEROUS!

**FIGURE 2-5**

PERSONNEL HANDLING POLICY

In 1998, the American Society of Mechanical Engineers issued a new American National Standard entitled, Personnel Lifting Systems, ASME B30.23-1998. This standard provides, ***"lifting and lowering of personnel using ASME B30 Standard hoisting equipment shall be undertaken only in circumstances when it is not possible to accomplish the task by less hazardous means. Unless all of the applicable requirements of this volume are met, the lifting or lowering of personnel using ASME B30 Standard equipment is prohibited."***

The ASME Standards recognize that mobile and locomotive cranes are primarily designed and intended for handling materials and not personnel. The ASME Standards have a retrofit statement that applies to existing cranes after the standards go into effect. It is not the intent of the standards to require retrofitting of existing equipment. If an item is being modified, the performance requirement shall be reviewed relative to the current standard. The standards contain more criteria than the current OSHA 1926.550.

This new standard is consistent with the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) regulations for Construction that state, in 29CFR1926.550(g)(2) General Requirements: ***"The use of a crane or derrick to hoist employees on a personnel platform is prohibited, except when the erection, use, and dismantling of conventional means of reaching the work site, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous or is not possible because of structural design or work site conditions."***

Use of a Manitowoc crane to handle personnel is acceptable provided:

- The crane user shall comply with the manufacturer's specifications and limitations for lifting accessories (hooks, slings, personnel platforms, etc.)
- The requirements of the applicable national, state and local regulations and safety codes are met.
- A determination has been made that use of a crane to handle personnel is the least hazardous means to perform the work.
- The crane operator shall be qualified to operate the specific type of hoisting equipment used in the personnel lift.
- The crane operator and occupants have been instructed in the recognized hazards of personnel platform lifts.
- The crane is in proper working order.
- Load and boom hoist drum brakes, swing brakes, and locking devices such as pawls and dogs shall be engaged when the occupied personnel platform is in a stationary position.

- The crane is equipped with a positive acting device which prevents contact between the load block or overhaul ball and the boom tip (anti-two block device).

For friction cranes, this implies the addition of spring applied brakes activated by the anti-two block device. The load line hoist drum shall have a system or device on the power train, other than the load hoist brake, which regulates the lowering rate of speed of the hoist mechanism (controlled load lowering).

- The crane's Operator's Manual is in the crane's cab, readily accessible to the Operator.
- The crane's load capacity chart is affixed inside the crane's cab, readily accessible to the operator. The total weight of the loaded personnel platform and related rigging shall not exceed 50 percent of the rated capacity for the radius and configuration of the crane.
- The crane is uniformly level within one percent of level grade and located on a firm footing. Some capacity charts require more stringent levelness criteria. Cranes with outriggers shall have them all fully deployed following manufacturer's specifications.
- Manitowoc prohibits personnel handling from its luffing jibs.
- The platform meets the requirements as prescribed by applicable standards and regulations.
- Applicable personnel protection equipment is provided (i.e., personnel fall-protection system, etc.)
- For wire rope suspended platforms, the crane is equipped with a hook latch that can be closed and locked, eliminating the throat opening.
- The platform is properly attached and secure.
- Direct attachment of a work platform to a luffing jib is prohibited.
- Personnel platforms must not be used if wind exceeds 20 mph (9 m/s).
- Hoisting personnel within 20 ft (6 m) of a power line that is up to 350 kV or within 50 ft (15 m) of a power line that is over 350 kV is PROHIBITED, except for work covered in OSHA 29CFR1926 subpart V.

For operation outside the United States, the requirements of the applicable national, state and local regulations and safety codes must be met. This may include, in addition to the above:

- Automatic brakes such that when the equipment operating controls are released, the motions are brought to rest.
- A holding device (such as a load hold check valve) shall be provided in the hydraulic or pneumatic systems to

prevent uncontrolled movement of the hoisting equipment in the case of a system failure.

Manitowoc offers upgrade packages for friction controlled models to install anti-two block, dead man control, and automatic hoist system control requirements to satisfy other codes and standards.

Manitowoc continues to recommend that cranes be properly maintained, regularly inspected and repaired as necessary. Manitowoc reminds crane owners that all safety decals must be in place and legible. Manitowoc continues to urge Manitowoc crane owners to upgrade their cranes with rated capacity indicator/limiter systems for all lifting operations.

Should you have any questions about this subject or other product safety matters relating to the operation and use of a Manitowoc crane, please contact Crane Care Customer Service or the Product Safety and Reliability Manager at the following address:

Manitowoc Cranes

2401 So. 30th St.
Manitowoc, WI 54220

Phone: 1-888-499-7278
Fax: 920-683-6390

PEDESTAL/BARGE MOUNTED CRANES



WARNING

Crane owner/user must verify that method used to fasten or restrain crane to foundation, barge, ship or floating platform is strong enough, under all operating conditions, to prevent crane from breaking off foundation or moving on barge.

Manitowoc does not permit use of a truck crane on a barge, ship or floating platform.

Pedestal Mounted Crane

Also see ASME publication B30.8-2004, Floating Cranes and Derricks.



WARNING

Overload Hazard!

A pedestal mounted crane will not tip to indicate to operator that crane's capacity has been exceeded. When capacity of a pedestal mounted crane is exceeded, turntable bearing, hook rollers (if equipped), or other structural components may break, before load lines fail, causing crane to separate from pedestal.

For this reason, great care must be taken to operate a pedestal mounted crane within its rated capacity.

Careful planning is required before a crane can be operated on a barge. Crane user shall verify that barge is capable of limiting crane list and/or dynamics to maximum allowable specified on capacity charts. If specified crane list and/or dynamic conditions are exceeded, crane's capacity may be exceeded; therefore, turntable bearing, hook rollers (if equipped), or other structural components may break, causing crane to separate from pedestal.

Definition

A pedestal mounted crane is a crane which is securely fastened to a foundation, barge, ship or floating platform so the crane is restrained from tipping.

Examples

1. Crane upperworks mounted on a turret (or tub) which is securely fastened to foundation (Figure 2-6).

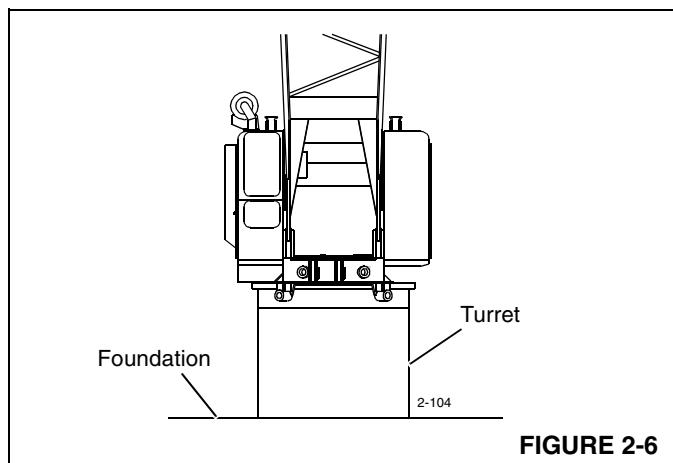
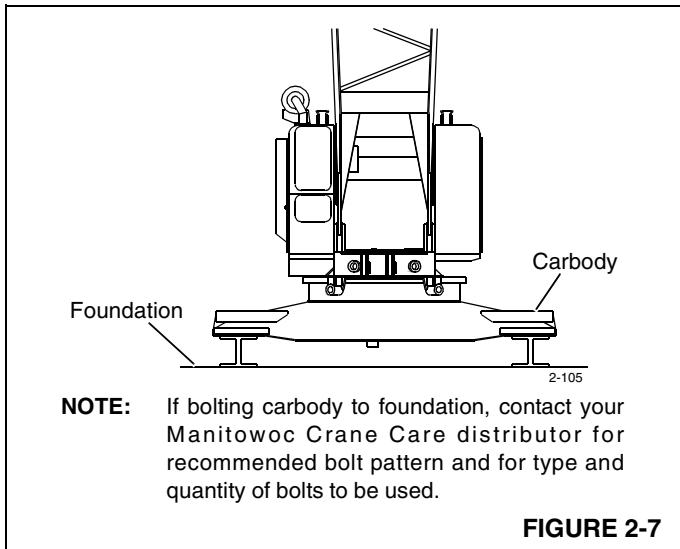


FIGURE 2-6

2. Crane upperworks mounted on a carbody (crawlers removed) which is securely fastened to foundation (Figure 2-7).



Barge Mounted Crane

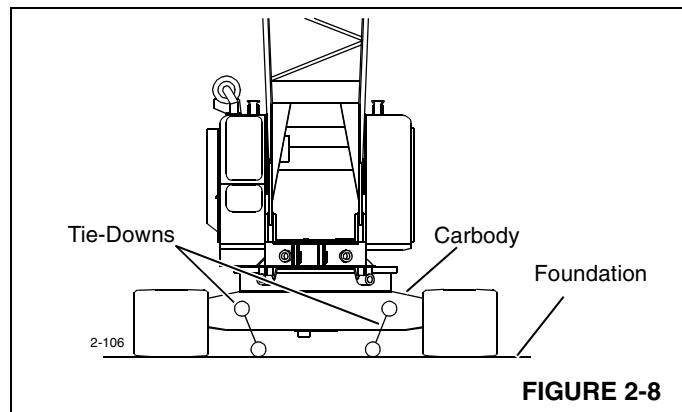
Definition

A barge mounted crane is a crane that is anchored or restrained in a work area of the barge, ship or floating platform and is subjected to tipping forces.

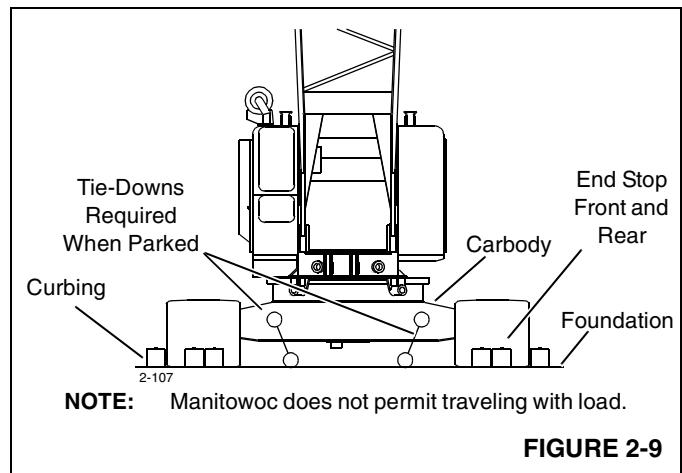
Examples

NOTE: The foundation is the deck of the barge, ship or floating platform.

1. Crawler-mounted crane with carbody anchored with tie-downs to foundation (Figure 2-8).



2. Crawler-mounted crane working on timbered area of barge, ship or floating platform with crawlers restrained by curbing and end stops (Figure 2-9). When not working, crane carbody is anchored with tie-downs to foundation. ***Traveling with load is not permitted.***



3. RINGER® (crawler mounted, carbody mounted) supported on blocking, screw jacks or steel pedestals which are braced and fastened to foundation in such a manner as to prevent movement (Figure 2-10).
4. RINGER (platform mounted) which has ring braced and fastened directly to foundation in such a manner as to prevent movement.

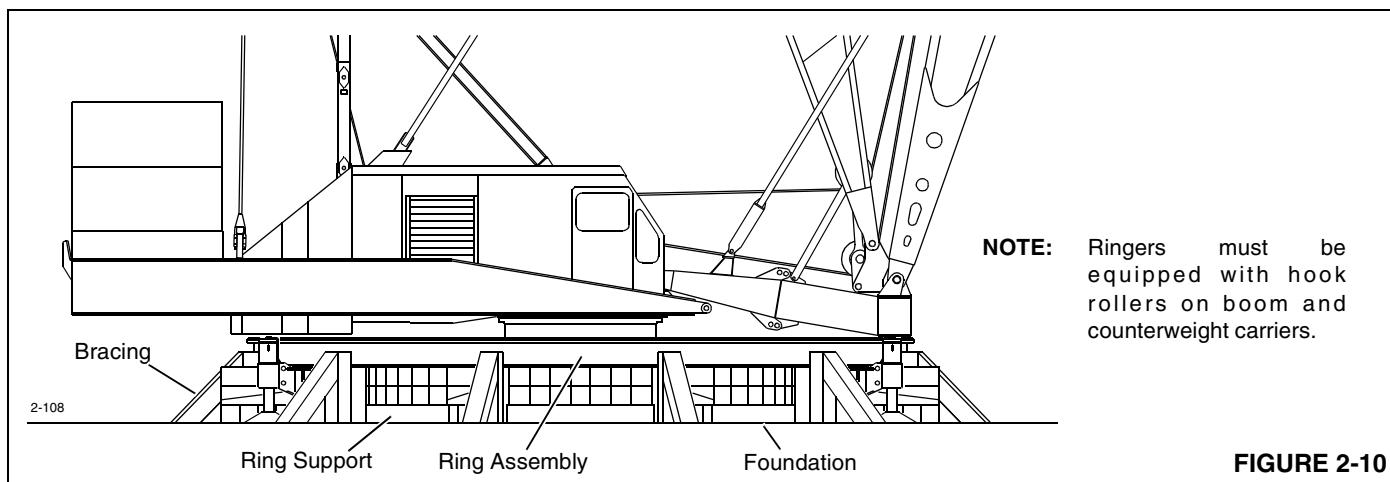


FIGURE 2-10

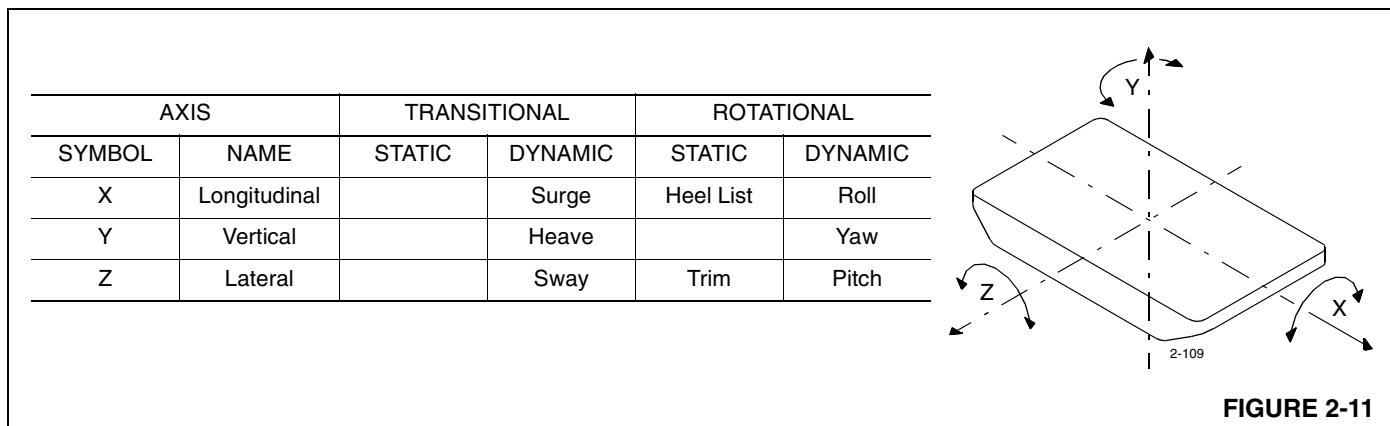


FIGURE 2-11

Capacity Charts

Manitowoc provides two types of capacity charts for a crane mounted on a barge or other supporting structure under static conditions.

1. A capacity chart based on tipping when crane is anchored only to prevent shifting.
2. A capacity chart based on structural competence when crane is securely fastened for use as a pedestal mounted crane.

NOTE: Unless otherwise specified on a machine list capacity chart, a "0" degree machine list capacity chart rating applies to machine list **not to exceed 1/2 degree**. All other machine list ratings – 1°, 2°, and 3° – must NOT be exceeded.

Shock Loading

Definition

Shock loads to the crane can be experienced when the barge is subjected to up and down movement of wave action

(referred to as DYNAMICS). Figure 2-11 illustrates the dynamic conditions of the barge which influence crane capacity.

CAUTION Structural Damage Hazard!

If crane boom or structure is shock loaded during operation, or there is any indication of shock loading, all structural components of crane shall be inspected to detect cracks and other damage. Nondestructive test equipment, such as magnetic particle or ultrasonic procedures, is recommended for this inspection.

NOTE: Manitowoc does not recommend crane operation under dynamic conditions. However, if operation under dynamic conditions is required, Manitowoc will consider issuing a capacity chart for dynamic conditions only after the crane user has provided the information listed on "Technical Data Sheet, T.S.100." This technical data sheet is available to the crane user upon request.

Operation On Barge

General

Machine list and/or dynamics will be experienced when a crane is operated on a barge, ship or floating platform. Both of these conditions reduce the crane's capacity, and each must be taken into account for safe operation on a barge, ship or floating platform.



WARNING

Tipping Crane Hazard!

Tie-downs which only prevent crane from shifting as in barge, ship or floating platform mounting, may not provide adequate support when using a capacity chart for pedestal mounting. Before operating a crane on a barge, ship or floating platform, crane user shall verify that correct capacity chart is being used — pedestal mounted, barge mounted, 0° , 1° , 2° or 3° list or dynamic capacity chart.

Failing to use correct capacity chart can result in an accident.

Definitions

1. *Machine List*, as defined by Manitowoc, is crane's out-of-level condition — from side-to-side — as measured by angle between horizontal and a line drawn through centerline of crane's boom hinge pins (Figure 2-12). This out-of-level condition creates side load and effects crane's lifting capacity.
2. *Barge List* (also referred to as heel or trim) causes swing out of the load and may produce side load. When Manitowoc provides a capacity chart showing capacities for a 2 degree machine list for example, we are referring to maximum allowable lifting capacity for crane when experiencing an out-of-level condition (side-to-side) of 2 degrees as measured by angle between horizontal and a line drawn through centerline of crane's boom hinge pins.
3. *Barge List and Machine List are not same*. As machine rotates on barge, barge list (as defined above) will change. Worst machine list condition generally occurs when machine swings over corner of barge, producing maximum side load.

Unless otherwise specified on capacity chart, barge list (heel or trim) must not exceed machine list degrees given on the capacity chart.

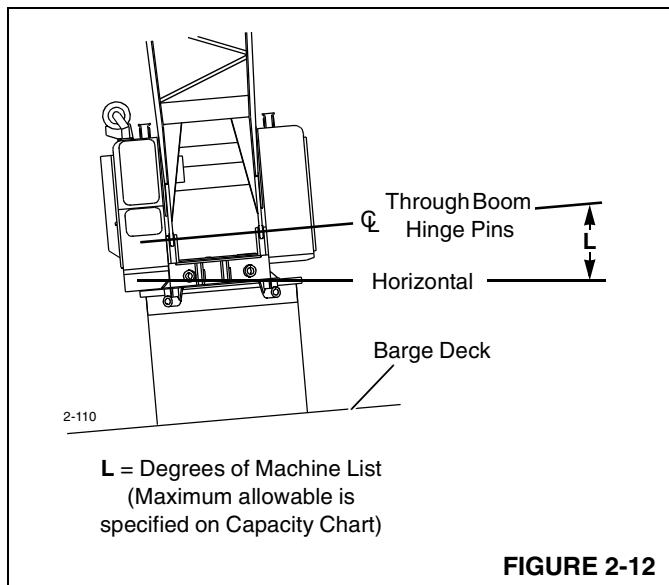


FIGURE 2-12

Crane Inspection

To aid in preventing harmful and damaging failure as previously indicated, regular inspection for signs of overloading in the following load bearing components is required. Correct each defect found before placing the crane into service.

- Boom
- Gantry
- Backhitch
- Rotating Frame
- Wire Rope
- Pendants and Straps
- Turntable Bearing

When equipped with hook rollers, it is recommended that each hook roller assembly be inspected daily for any sign of overloading, to include:

- Deformation of roller path.
- Proper hook roller adjustment.
- Deformation or cracks in hook roller hanger.
- Bent hook roller shaft.
- Damaged bearings.

Transporting Crane on Barge

If it is necessary to transport the crane on a barge, ship or floating platform when dynamic conditions will be experienced, the boom shall be lowered onto a cradle (or other support) and the boom, crane upperworks and lowerworks shall be secured against movement. If the crane

is equipped with a mast, the mast shall be securely tied down with guylines. Failing to take these steps can result in shock load or side load damage to the boom and mast.

SAFETY AND INFORMATION SIGNS

Maintaining Signs

The crane owner/user shall make sure that all signs are legible and installed at the proper locations on the crane. If a sign has been defaced or removed, it must be replaced immediately. See Nameplates and Decals Drawing in this section for the installation locations of signs.

Ordering Signs

Order replacement signs from your Manitowoc Crane Care distributor or from the factory at the following address:

Manitowoc Crane Care

2401 So. 30th St.
Manitowoc, WI 54220

Phone: 920-684-6621
Fax: 920-683-6278
E-mail: laticeteam@manitowoc.com

When ordering a sign, give the crane model number, the serial number, and the name and part number of the sign (Figure 2-13). If the sign has a figure number, it can be used if the drawing number is missing.

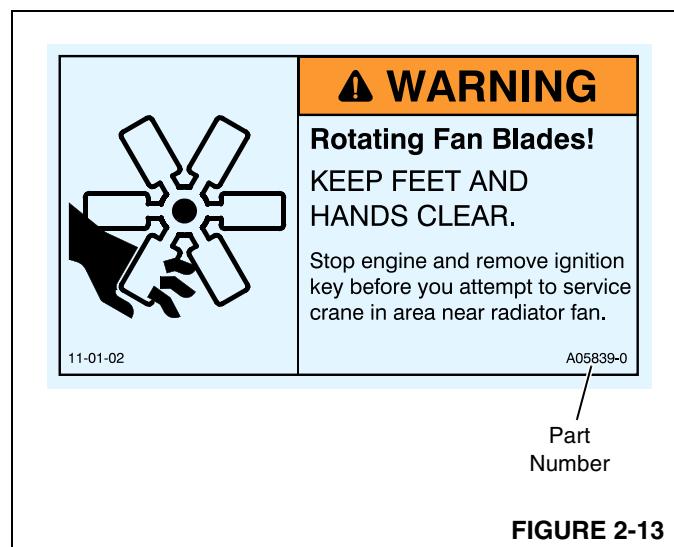


FIGURE 2-13



OPERATOR'S MANUAL SECTION 2 INSERTS

18000 Luffing Jib – Serial Number 18005910

Drawing 175916

Drawing A06702

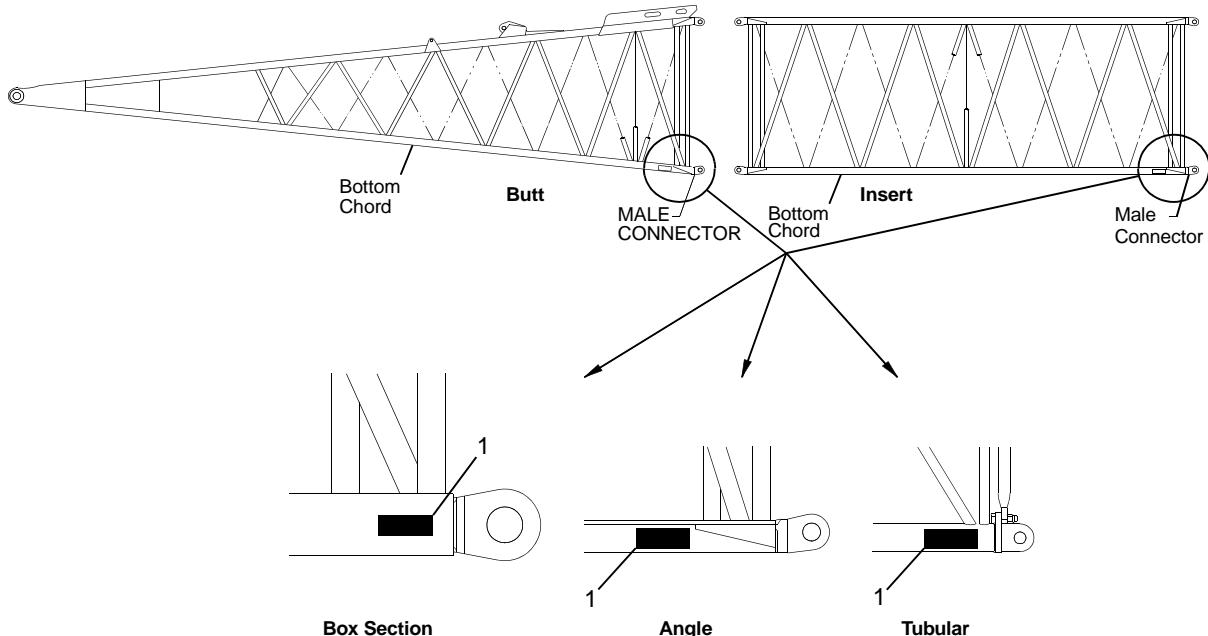
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06/25/2008

Nameplates and Decals – Boom Disassembly

Nameplate And Decals

MANITOWOC CRANES, INC.

Eng Rev
02-22-05

MODEL

All

NAMPLATE & DECAL ASSEMBLY

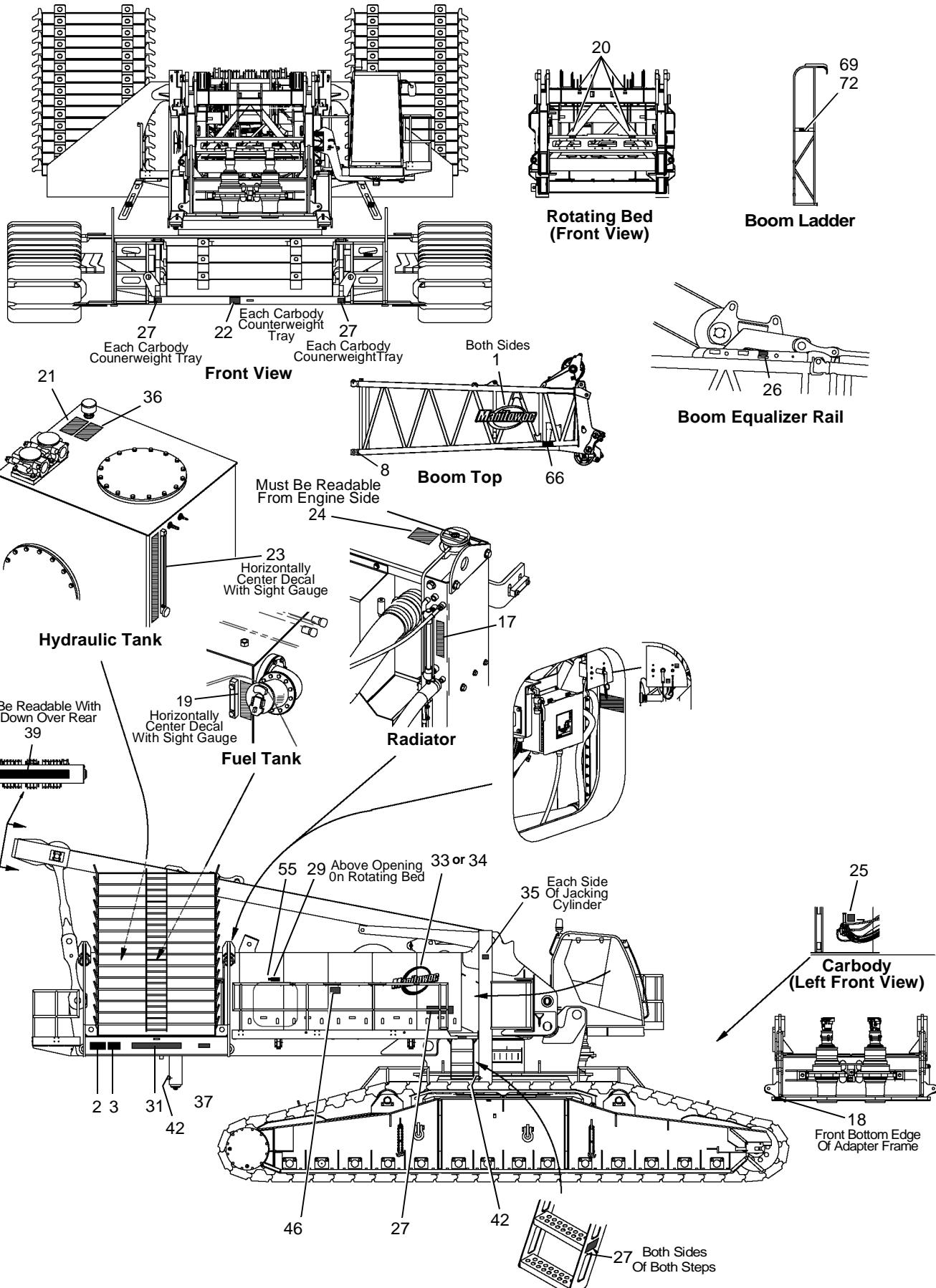
Boom Disassembly (see Note 1)

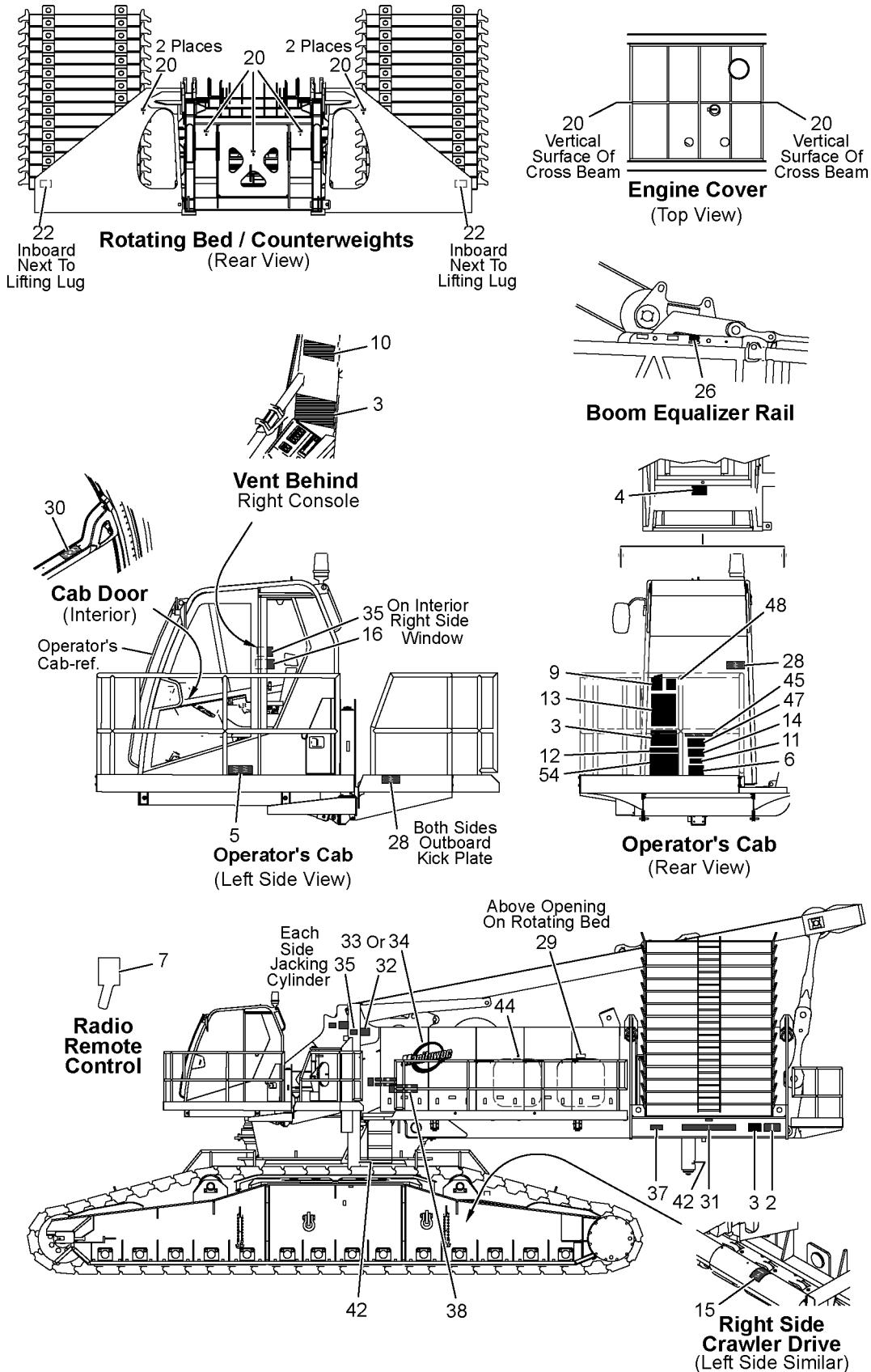
ITEM	PART #	QTY.	DESCRIPTION OF PART
DANGER DECAL (ENGLISH)			
1	147852	2	DECAL, Danger (Boom Hazard) (see Notes 2 & 3)
DANGER DECAL (DUTCH)			
1	386315	2	DECAL, Danger (Boom Hazard) (see Notes 2 & 3)
DANGER DECAL (CHINESE)			
1	386299	2	DECAL, Danger (Boom Hazard) (see Notes 2 & 3)
DANGER DECAL (SPANISH)			
1	386300	2	DECAL, Danger (Boom Hazard) (see Notes 2 & 3)
DANGER DECAL (FRENCH)			
1	386301	2	DECAL, Danger (Boom Hazard) (see Notes 2 & 3)
DANGER DECAL (PORTUGUESE)			
1	386492	2	DECAL, Danger (Boom Hazard) (see Notes 2 & 3)
DANGER DECAL (GERMAN)			
1	A10090	2	DECAL, Danger (Boom Hazard) (see Notes 2 & 3)
DANGER DECAL (RUSSIAN)			
1	A12529	2	DECAL, Danger (Boom Hazard) (see Notes 2 & 3)
DANGER DECAL (ITALIAN)			
1	A11581	2	DECAL, Danger (Boom Hazard) (see Notes 2 & 3)
<p>Note 1: Applies to all pin-connected booms, jibs, masts and towers.</p> <p>Note 2: Two decals required on bottom chords (1 per side) of butt and each insert (at male connector end).</p> <p>Note 3: Apply decal to clean smooth surface as close as possible to both bottom male connectors as shown.</p>			

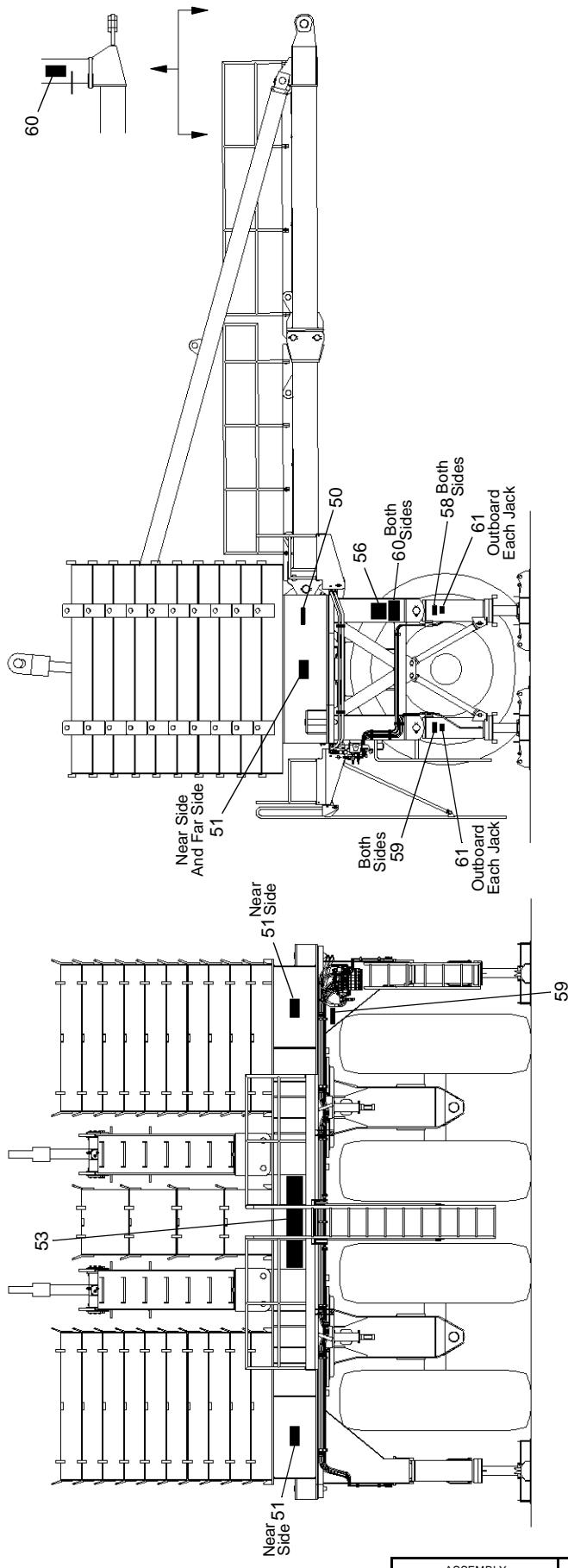
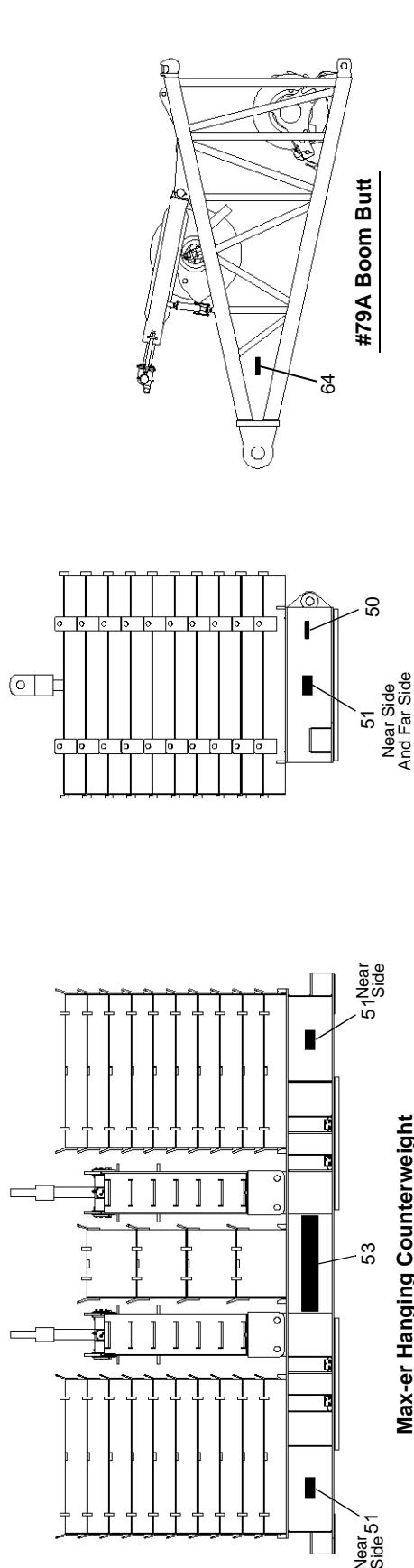
PLEASE GIVE MACHINE SERIAL NUMBER WITH ORDER

ASSEMBLY
175916REVISION
G

MANITOWOC CRANES, INC.







MODEL

18000

NAMEPLATE & DECALS

ITEM	PART #	QTY.	DESCRIPTION OF PART
1		2	SIGN, Boom-Manitowoc (see Note 3)
2	95494	2	DECAL, Danger-Stay Clear (English Language)
	386218	2	DECAL, Danger-Stay Clear (Chinese Language)
	386219	2	DECAL, Danger-Stay Clear (Spanish Language)
	A11570	2	DECAL, Danger-Stay Clear (Italian Language)
	81000708	2	DECAL, Danger-Stay Clear (Korean)
3	95496	4	DECAL, Danger-Electrocution Hazard (English Language)
	386239	4	DECAL, Danger-Electrocution Hazard (Chinese Language)
	386240	4	DECAL, Danger-Electrocution Hazard (Spanish Language)
	A11571	4	DECAL, Danger-Electrocution Hazard (Italian Language)
	81000709	4	DECAL, Danger-Electrocution Hazard (Korean)
4	97281	1	DECAL, Warning-Fall Hazard (English Language)
	386203	1	DECAL, Warning-Fall Hazard (Chinese Language)
	386204	1	DECAL, Warning-Fall Hazard (Spanish Language)
	A11572	1	DECAL, Warning-Fall Hazard (Italian Language)
	81000710	1	DECAL, Warning-Fall Hazard (Korean)
5	147834	1	DECAL, Epic (3" X 8 7/8") (see Note1)
6	147848	1	DECAL, Patents (English Language)
	386272	1	DECAL, Patents (Chinese Language)
	386273	1	DECAL, Patents (Spanish Language)
	A11579	1	DECAL, Patents (Italian Language)
	81000712	1	DECAL, Patents (Korean)
7	172859	1	DECAL, Warning-Read Manual Remote (English Language)
	386290	1	DECAL, Warning-Read Manual Remote (Chinese Language)
	386291	1	DECAL, Warning-Read Manual Remote (Spanish Language)
	A11582	1	DECAL, Warning-Read Manual Remote (Italian Language)
	81000714	1	DECAL, Warning-Read Manual Remote (Korean)
8	175916		DECAL, Danger-Boom Sections (English Language) (see Note 4)
9	176835	1	DECAL, Made In USA
10	176882	1	DECAL, Warning-Operators Manual (English Language)
	A09047	1	DECAL, Warning-Operators Manual (Chinese Language)
	A01131	1	DECAL, Warning-Operators Manual (Spanish Language)
	A11586	1	DECAL, Warning-Operators Manual (Italian Language)
	81000718	1	DECAL, Warning-Operators Manual (Korean)
11	176927	1	DECAL, ANSI B30.B (English Language)
	A09050	1	DECAL, ANSI B30.B (Chinese Language)
	A01161	1	DECAL, ANSI B30.B (Spanish Language)
	A11587	1	DECAL, ANSI B30.B (Italian Language)
	81000720	1	DECAL, ANSI B30.B (Korean)
12	181503	1	PLATE, Crane I.D
13	184679	1	DECAL, Hand Signal (English Language)
	386212	1	DECAL, Hand Signal (Chinese Language)
	386213	1	DECAL, Hand Signal (Spanish Language)
	A11591	1	DECAL, Hand Signal (Italian Language)
	81000732	1	DECAL, Hand Signal (Korean)
14	197025	1	DECAL, Caution-Welding (English Language)
	A09061	1	DECAL, Caution-Welding (Chinese Language)
	A01143	1	DECAL, Caution-Welding (Spanish Language)
	A11622	1	DECAL, Caution-Welding (Italian Language)

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A06702**Y****PLEASE GIVE MACHINE SERIAL NUMBER WITH ORDER**

MODEL 18000			
NAMEPLATE & DECALS			
ITEM	PART #	QTY.	DESCRIPTION OF PART
15	81000738	1	DECAL, Caution-Welding (Korean)
	179030	2	DECAL, Warning-Rotating Drive Shaft (English Language)
	386530	2	DECAL, Warning-Rotating Drive Shaft (Chinese Language)
	A09559	2	DECAL, Warning-Rotating Drive Shaft (Spanish Language)
	A11589	2	DECAL, Warning-Rotating Drive Shaft (Italian Language)
	81000727	2	DECAL, Warning-Rotating Drive Shaft (Korean)
16	A06914	1	DECAL, Drum Identification (English Language)
	A10475	1	DECAL, Drum Identification (Chinese Language)
	A12562	1	DECAL, Drum Identification (Spanish Language)
	A11639	1	DECAL, Drum Identification (Italian Language)
	81001103	1	DECAL, Drum Identification (Korean)
17	A06726	1	DECAL, Coolant Level (English Language)
	A10476	1	DECAL, Coolant Level (Chinese Language)
	A12561	1	DECAL, Coolant Level (Spanish Language)
	A11638	1	DECAL, Coolant Level (Italian Language)
18	81001104	1	DECAL, Coolant Level (Korean)
	81003025	1	DECAL, Radius (English Language)
	81003026	1	DECAL, Radius (Chinese Language)
	81003029	1	DECAL, Radius (Spanish Language)
19	81003027	1	DECAL, Radius (Italian Language)
	81003028	1	DECAL, Radius (Korean)
	A06725	1	DECAL, Diesel Fuel Level (English Language)
20	A10478	1	DECAL, Diesel Fuel Level (Chinese Language)
	A12560	1	DECAL, Diesel Fuel Level (Spanish Language)
	A11637	1	DECAL, Diesel Fuel Leve (Italian Language)
	81001114	1	DECAL, Diesel Fuel Leve (Korean)
21	A07227	3	DECAL, Warning-Fall Hazard (English Language) (see Note 5)
	A10479	3	DECAL, Warning-Fall Hazard (Chinese Language) (see Note 5)
	A12563	3	DECAL, Warning-Fall Hazard (Spanish Language) (see Note 5)
	A11640	3	DECAL, Warning-Fall Hazard (Italian Language) (see Note 5)
	81001115	3	DECAL, Warning-Fall Hazard (Korean) (see Note 5)
22	A18077	1	DECAL, Cauton-Hydraulic Tank Fill (English Language)
	A18991	1	DECAL, Cauton-Hydraulic Tank Fill (Chinese Language)
	A18858	1	DECAL, Cauton-Hydraulic Tank Fill (Spanish Language)
	A18994	1	DECAL, Cauton-Hydraulic Tank Fill (Italian Language)
23	81000724	1	DECAL, Cauton-Hydraulic Tank Fill (Korean)
	98739	4	DECAL, Warning-Crush Hazard (English Language)
	386224	4	DECAL, Warning-Crush Hazard (Chinese Language)
	A12555	4	DECAL, Warning-Crush Hazard (Spanish Language)
	A11573	4	DECAL, Warning-Crush Hazard (Italian Language)
24	81000711	4	DECAL, Warning-Crush Hazard (Korean)
	A06703	1	DECAL, Hydraulic Oil Level (English Language) (see Note1)
	A10481	1	DECAL, Hydraulic Oil Level (Chinese Language) (see Note1)
	A12557	1	DECAL, Hydraulic Oil Level (Spanish Language) (see Note1)
25	A11634	1	DECAL, Hydraulic Oil Level (Italian Language) (see Note1)
	81001113	1	DECAL, Hydraulic Oil Level (Korean) (see Note1)
	A04412	1	Decal, Warning-Coolant Burn Hazard (English Language) (see Note1)
26	A09043	1	Decal, Warning-Coolant Burn Hazard (Chinese Language) (see Note1)
	A09569	1	Decal, Warning-Coolant Burn Hazard (Spanish Language) (see Note1)

PLEASE GIVE MACHINE SERIAL NUMBER WITH ORDER

ASSEMBLY A06702	REVISION Y
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MODEL 18000			
NAMEPLATE & DECALS			
ITEM	PART #	QTY.	DESCRIPTION OF PART
25	A11630	1	Decal, Warning-Coolant Burn Hazard (Italian Language) (see Note1)
	81000741	1	Decal, Warning-Coolant Burn Hazard (Korean) (see Note1)
	A07321	1	DECAL, Crawler Pins Controls (English Language)
	A10482	1	DECAL, Crawler Pins Controls (Chinese Language)
	A12564	1	DECAL, Crawler Pins Controls (Spanish Language)
	A11641	1	DECAL, Crawler Pins Controls (Italian Language)
26	81001116	1	DECAL, Crawler Pins Controls (Korean)
	194183	2	DECAL, Caution-Boom Equalizer Rails (English Language)
	A10483	2	DECAL, Caution-Boom Equalizer Rails (Chinese Language)
	A09365	2	DECAL, Caution-Boom Equalizer Rails (Spanish Language)
	A11595	2	DECAL, Caution-Boom Equalizer Rails (Italian Language)
27	81001108	2	DECAL, Caution-Boom Equalizer Rails (Korean)
	A07339	8	DECAL, Warning-Crush Hazard (English Language)
	A10484	8	DECAL, Warning-Crush Hazard (Chinese Language)
	A12565	8	DECAL, Warning-Crush Hazard (Spanish Language)
28	A11642	8	DECAL, Warning-Crush Hazard (Italian Language)
	81000743	8	DECAL, Warning-Crush Hazard (Korean)
	A07353	3	DECAL, Warning-Crush Hazard (English Language)
	A10485	3	DECAL, Warning-Crush Hazard (Chinese Language)
29	A12566	3	DECAL, Warning-Crush Hazard (Spanish Language)
	A11643	3	DECAL, Warning-Crush Hazard (Italian Language)
	81001117	3	DECAL, Warning-Crush Hazard (Korean)
	192249	2	DECAL, Warning-moving Part Hazard (English Language)
30	A10486	2	DECAL, Warning-moving Part Hazard (Chinese Language)
	A12556	2	DECAL, Warning-moving Part Hazard (Spanish Language)
	A11594	2	DECAL, Warning-moving Part Hazard (Italian Language)
	81001107	2	DECAL, Warning-moving Part Hazard (Korean)
31	A07388	1	DECAL, Warning-Pinch Point Hazard (English Language)
	A10487	1	DECAL, Warning-Pinch Point Hazard (Chinese Language)
	A12557	1	DECAL, Warning-Pinch Point Hazard (Spanish Language)
	A11644	1	DECAL, Warning-Pinch Point Hazard (Italian Language)
32	81001118	1	DECAL, Warning-Pinch Point Hazard (Korean)
	386567	2	DECAL, Manitowoc
33	539090	2	DECAL, Manitowoc Logo (40") Red Ball
	or	2	DECAL, Manitowoc Logo (40") Red Ball
34	539091	2	DECAL, Manitowoc Logo (40") Clear Ball
	35	5	DECAL, Caution-Jacking Cylinder Damage (English Language)
35	A07883	5	DECAL, Caution-Jacking Cylinder Damage (Chinese Language)
	A10489	5	DECAL, Caution-Jacking Cylinder Damage (Spanish Language)
	A12569	5	DECAL, Caution-Jacking Cylinder Damage (Italian Language)
	A11646	5	DECAL, Caution-Jacking Cylinder Damage (Korean)
	81001120	5	DECAL, Warning - Burn Hazard (English Language)
36	A08167	1	DECAL, Warning - Burn Hazard (Chinese Language)
	A10490	1	DECAL, Warning - Burn Hazard (Spanish Language)
	A12570	1	DECAL, Warning - Burn Hazard (Italian Language)
	A11647	1	DECAL, Warning - Burn Hazard (Korean)
37	81001121	1	DECAL, Manitowoc Crane Group
	A10544	2	DECAL, 18000 Model No. (see Note1)
38	A06767	2	DECAL, 18000 Model No. (see Note1)
	A06768	1	DECAL, Manitowoc 18000 (see Note1)

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MODEL	18000		
NAMEPLATE & DECALS			
ITEM	PART #	QTY.	DESCRIPTION OF PART
40	A11450	1	DECAL, OFF
	A13350	1	DECAL, OFF (Chinese Language)
41	A11451	1	DECAL, ON
	A13351	1	DECAL, ON (Chinese Language)
43	A11449	1	DECAL, Decal Battery Disconnect (English Language)
	A13349	1	DECAL, Decal Battery Disconnect (Chinese Language)
	A13807	1	DECAL, Decal Battery Disconnect (Spanish Language)
	A14199	1	DECAL, Decal Battery Disconnect (Italian Language)
	81000744	1	DECAL, Decal Battery Disconnect (Korean)
44	A15213	1	DECAL, Pump Drive Oil Dipstick
54	81001530	1	DECAL, Warning-Read Manual (English Language)
	386206	1	DECAL, Warning-Read Manual (Chinese Language)
	386207	1	DECAL, Warning-Read Manual (Spanish Language)
	A11590	1	DECAL, Warning-Read Manual (Italian Language)
	81000730	1	DECAL, Warning-Read Manual (Korean Language)
55	A15212	1	DECAL, Engine Oil Dipstick
ROTATING BED JACKS NAMEPLATE/DECALS - OPTION			
42	176856	4	DECAL, Warning-Crush Hazard (English Language)
	A09064	4	DECAL, Warning-Crush Hazard (Chinese Language)
	A09344	4	DECAL, Warning-Crush Hazard (Spanish Language)
	176856	4	DECAL, Warning-Crush Hazard (Italian Language)
	81000744	4	DECAL, Warning-Crush Hazard (Korean Language)
EUROPE NAMEPLATE/DECALS - OPTION			
45	A04559	1	NAMEPLATE, QSX15 Tier-2 Emission Tag
46	197151	1	DECAL, Fire Extinguisher (English Language)
	A09066	1	DECAL, Fire Extinguisher (Chinese Language)
	A01153	1	DECAL, Fire Extinguisher (Spanish Language)
	A11623	1	DECAL, Fire Extinguisher (Italian Language)
	81000740	1	DECAL, Fire Extinguisher (Korean Language)
47	177828	1	DECAL, CE
48	A05714	1	DECAL, Sound Power Level 111db
MAX-ER HANGING COUNTERWEIGHT AND MAX-ER WHEELED COUNTERWEIGHT - OPTION:			
50	181503	1	DECAL, I.D. - USA Made
51	95494	4	DECAL, Danger (Stay Clear) (English Language)
	386218	4	DECAL, Danger (Stay Clear) (Chinese Language)
	386219	4	DECAL, Danger (Stay Clear) (Spanish Language)
	A11570	4	DECAL, Danger (Stay Clear) (Italian Language)
	81000708	4	DECAL, Danger (Stay Clear) (Korean Language)
53	538663	1	DECAL (Max-er) - 59"
MAX-ER WHEELED COUNTERWEIGHT - OPTION:			
56	181503	1	DECAL, I.D. - USA Made (English Language)
58	176856	4	DECAL, Warning, Crush Hazard (English Language)
	A09064	4	DECAL, Warning, Crush Hazard (Chinese Language)
	A09344	4	DECAL, Warning, Crush Hazard (Spanish Language)
	A11585	4	DECAL, Warning, Crush Hazard (Italian Language)
	81000716	4	DECAL, Warning, Crush Hazard (Korean Language)
59	195270	1	DECAL, Max-er Controls (English Language)
	A13438	1	DECAL, Max-er Controls (Chinese Language)

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MODEL

18000

NAMEPLATE & DECALS

ITEM	PART #	QTY.	DESCRIPTION OF PART
60	A09372	1	DECAL, Max-er Controls (Spanish Language)
	A11598	1	DECAL, Max-er Controls (Italian Language)
	81001109	1	DECAL, Max-er Controls (Korean Language)
	195435	3	DECAL, Warning (Tipping Hazard) (English Language)
	A13439	3	DECAL, Warning (Tipping Hazard) (Chinese Language)
	A09373	3	DECAL, Warning (Tipping Hazard) (Spanish Language)
	A11599	3	DECAL, Warning (Tipping Hazard) (Italian Language)
61	81001110	3	DECAL, Warning (Tipping Hazard) (Korean Language)
	A05204	4	DECAL, Caution (Tire Inflation) (English Language) (see Note 6)
	A09653	4	DECAL, Caution (Tire Inflation) (Chinese Language) (see Note 6)
	A09370	4	DECAL, Caution (Tire Inflation) (Spanish Language) (see Note 6)
	A11633	4	DECAL, Caution (Tire Inflation) (Italian Language) (see Note 6)
	81001111	4	DECAL, Caution (Tire Inflation) (Korean Language) (see Note 6)
#79A LUFTING JIB - OPTION:			
64	181503	1	DECAL, I.D. - USA Made (English Language)
66	A10003	1	DECAL, Operating Instructions (English Language)
	A10003	1	DECAL, Operating Instructions (Chinese Language)
	A15471	1	DECAL, Operating Instructions (Spanish Language)
	A11648	1	DECAL, Operating Instructions (Italian Language)
	81001122	1	DECAL, Operating Instructions (Korean Language)
#80 BOOM LADDER - OPTION:			
69	177837	1	DECAL, Warning (Boom Ladder) (English Language)
	A09072	1	DECAL, Warning (Boom Ladder) (Chinese Language)
	A13358	1	DECAL, Warning (Boom Ladder) (Spanish Language)
	A11588	1	DECAL, Warning (Boom Ladder) (Italian Language)
	8100725	1	DECAL, Warning (Boom Ladder) (Korean Language)
#81 BOOM LADDER - OPTION:			
72	177837	1	DECAL, Warning (Boom Ladder) (English Language)
	A09072	1	DECAL, Warning (Boom Ladder) (Chinese Language)
	A13358	1	DECAL, Warning (Boom Ladder) (Spanish Language)
	A11588	1	DECAL, Warning (Boom Ladder) (Italian Language)
	8100725	1	DECAL, Warning (Boom Ladder) (Korean Language)
			Note 1: -3 Black Letters -4 White Letters -5 Clear Letters W/white Outline
			Note 2: Refer to boom and jib rigging drawing for part number
			Note 3: Not Shown See 175916 for quantities and placement.
			Note 4: Position decal by safety harness anchor.

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SECTION 3

OPERATING CONTROLS AND PROCEDURES

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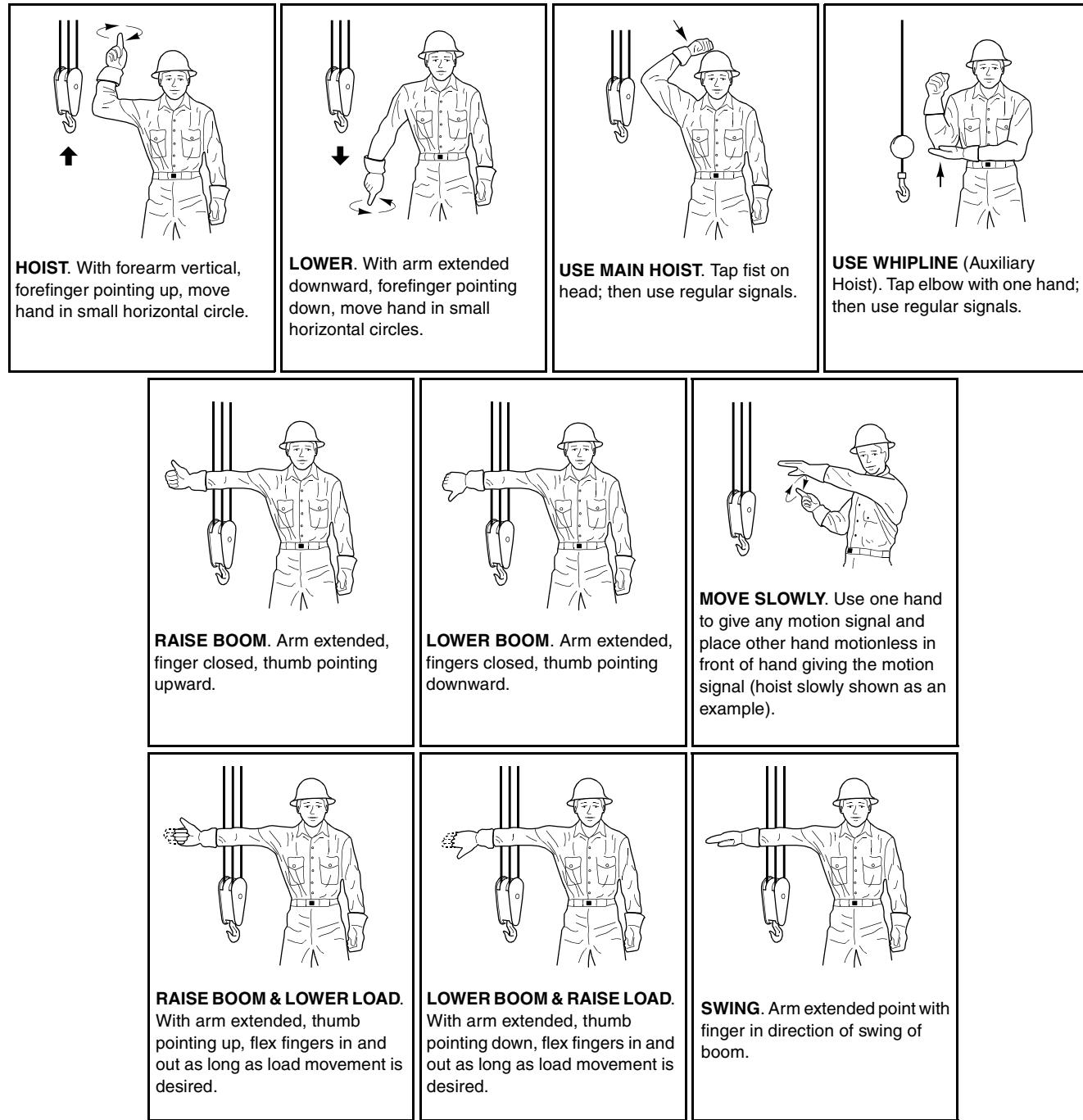
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SECTION 3

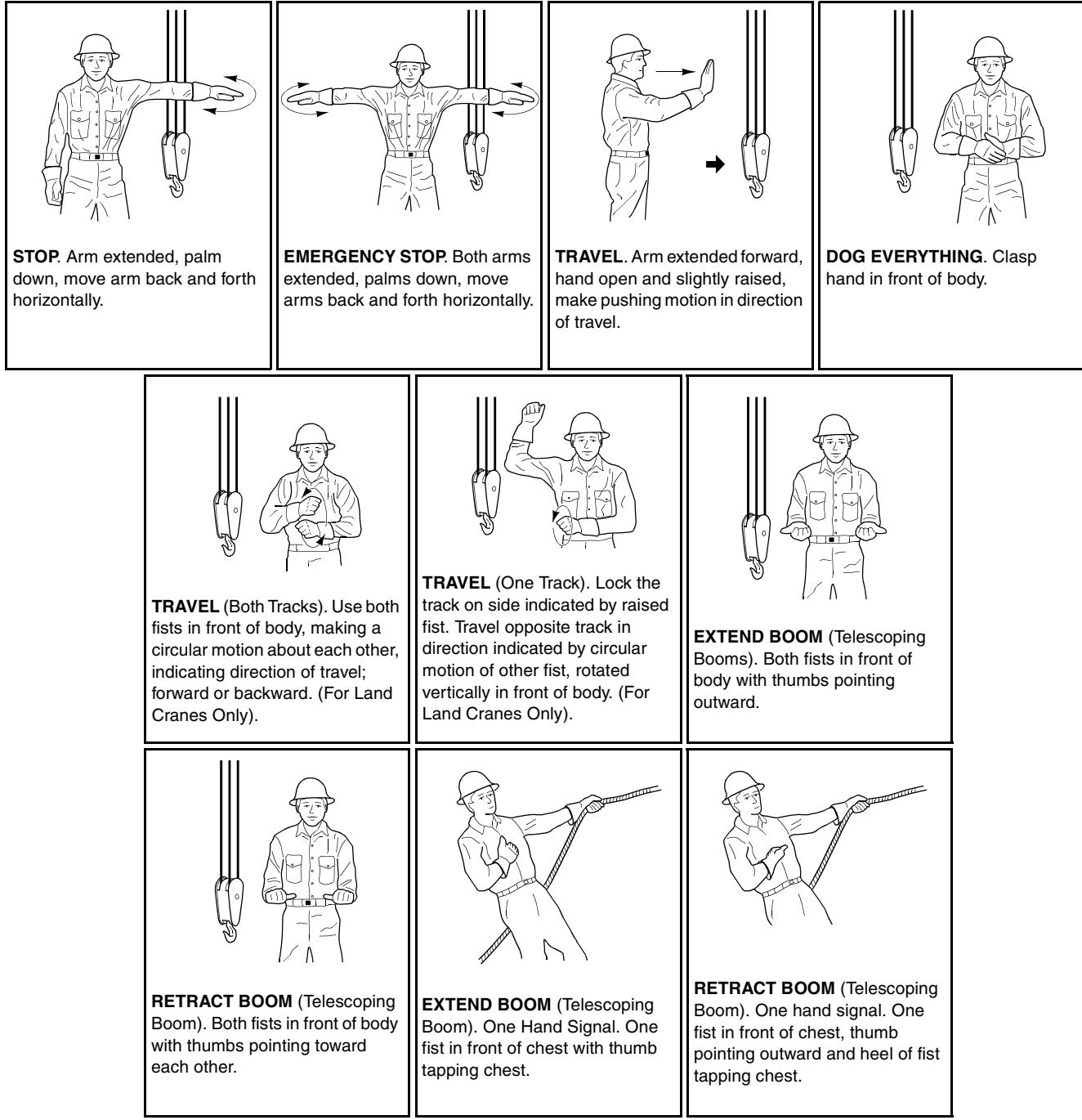
OPERATION

STANDARD HAND SIGNALS FOR CONTROLLING CRANE OPERATIONS

The following standard hand signals comply with ASME B30.5 - 2007



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da0109

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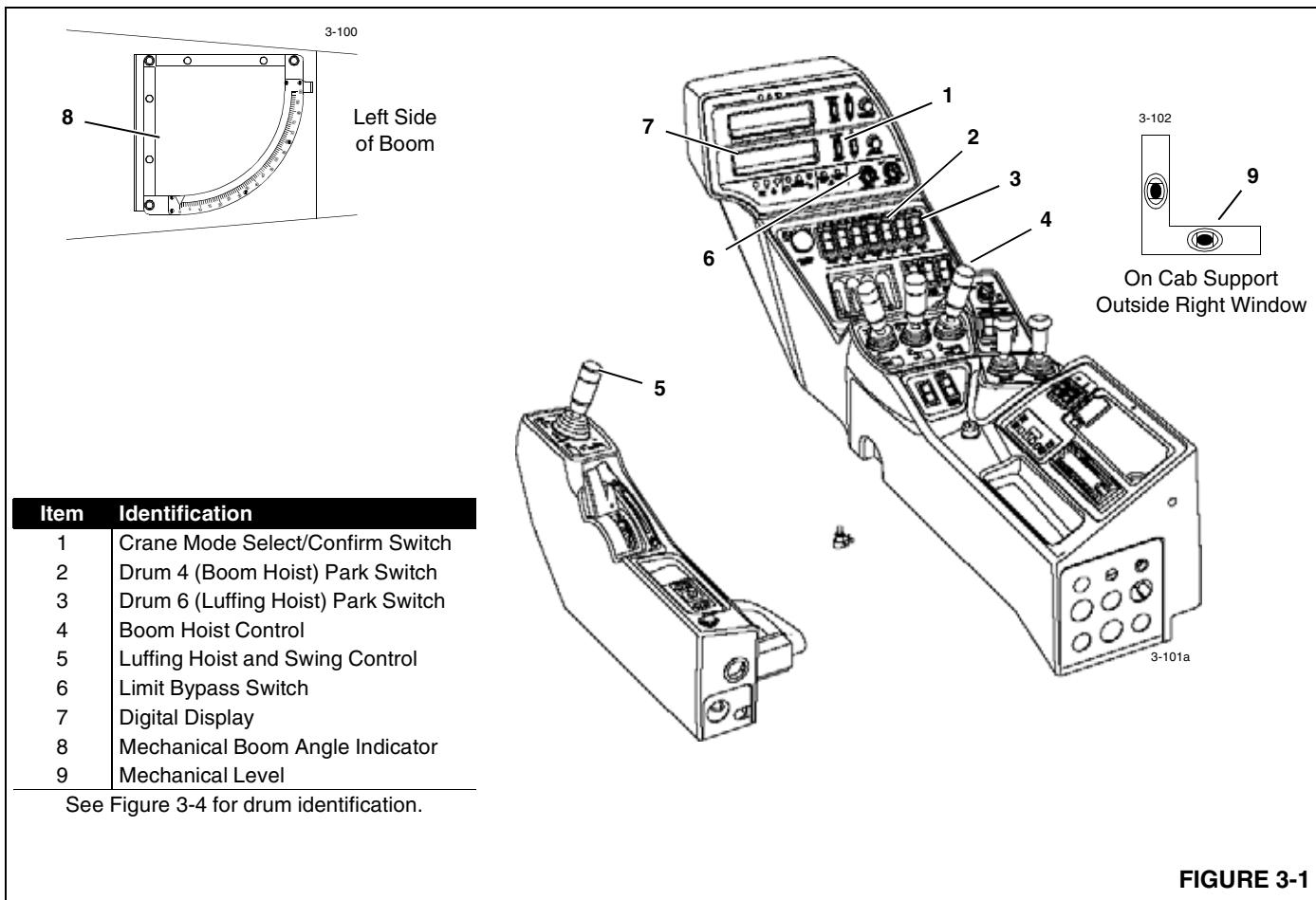


FIGURE 3-1

GENERAL OPERATION

The instructions in this section supplement the operating control instructions in the Crane Operator's Manual. This section has two purposes:

- To familiarize *qualified operators* with the location of the controls used for luffing jib operation.
- To alert operators to important safety information.



WARNING

Prevent death or serious injury to personnel!

Luffing jib attachment must be installed and operated by experienced personnel trained in erection and operation of construction cranes. These personnel shall read, understand, and comply with instructions in this manual, in Crane Operator's Manual, and in Luffing Jib Rigging drawings and Capacity Charts.

LUFTING JIB OPERATING CONTROLS

See Figure 3-1 for Location of Controls

1 – Crane Mode Select/Confirm Switch

See Operating Controls in Section 3 of your Crane Operator's Manual for operation of the crane mode switch.

This switch is used to select and confirm the following modes:

- LUFTING JIB mode for normal operation.
- LJIB STOP mode for extending and retracting the jib stop positioner cylinders during the luffing jib raising and lowering procedures.

When the luffing jib mode is selected and confirmed, **LUFTING JIB ON** appears on the display as shown in Figure 3-2. The luffing hoist and boom hoist control handles switch to the locations shown in Figure 3-1.

If equipped with a MAX-ER attachment, the MAX-ER mode must also be selected and confirmed. Once selected and confirmed, the *M on the right end of the display indicates that the MAX-ER mode is on (Figure 3-2).

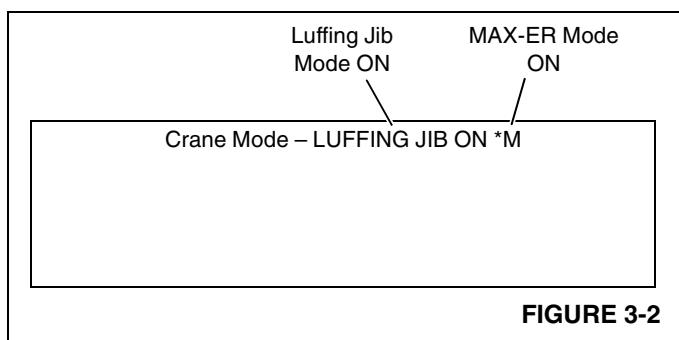


FIGURE 3-2

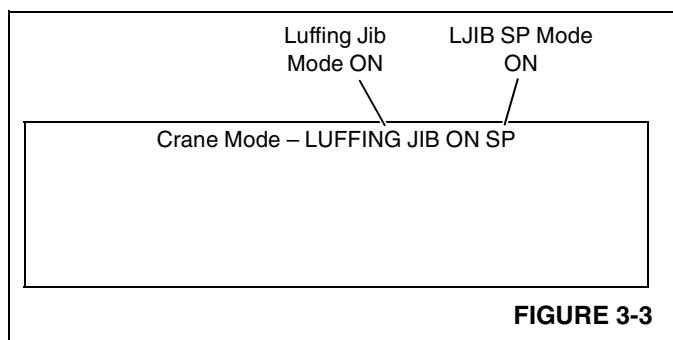


FIGURE 3-3

To operate the #79A jib stop positioner cylinders during luffing jib raising and lowering, proceed as follows:

1. Select proper #79A luffing jib chart in Rated Capacity Indicator/Limiter.
2. Select and confirm luffing jib mode. After confirming this mode, top line of display should read (see Figure 3-3):

Crane Mode - LUFFING JIB ON

3. To retract jib stop positioner cylinders, select and confirm LJIB STOP mode. After confirming this mode, top line of display should read:

Crane Mode - LUFFING JIB ON SP

SP in this line means that jib stop positioner cylinders should be retracting (power applied to solenoid).

4. To extend jib stop positioner cylinders, select and confirm mode LJIB STOP again. After confirming this mode, top line should now read:

Crane Mode - LUFFING JIB ON

SP is gone and power is removed from solenoid. Cylinders should extend fully.



WARNING

Moving Part Hazard!

If retracted, jib stop positioner cylinders will extend (jib stops rise) when engine is stopped.

2 – Drum 4 (Boom Hoist) Park Switch

3 – Drum 6 (Luffing Hoist) Park Switch

4 – Boom Hoist and Whip Hoist Control

5 – Luffing Hoist and Swing Control

See Operating Controls in Section 3 of crane Operator's Manual for operation of above controls.

6 – Normal Limit Bypass Switch

This switch bypasses the limits identified in Table 3-1.



WARNING

When bypassing a limit, carefully follow instructions under Limit Devices topic in this section.

Insert key. Turn CLOCKWISE and HOLD to BYPASS (disable) reached operating limits. This position allows functions to be operated beyond the limits.

RELEASE to ENABLE operating limits. This position allows limits to stop functions in the normal manner.

Remove key to prevent unauthorized operation.

Table 3-1 Bypassable Limit Identification

Limit	Non-European Standard By-pass (Momentary Key Switch)	European Standard By-pass (Momentary Key Switch)
(past production with quadrant style jib stop)		
Boom Up Limit	Yes	
Boom Down Limit	Yes	Yes
Block-Up Limit (each drum)	Yes	Yes
Bail Limits - Max and Min (each drum)	Yes	Yes
Rated Capacity Indicator/Limiter	Yes	Yes
Luffing Jib Maximum Up 1	Yes	Yes
Luffing Jib Maximum UP 2 ¹	Yes	Yes
Luffing Jib Down	Yes	Yes
(current production without quadrant style jib stop)		
Boom Up Limit	YES	
Boom Down Limit	Yes	Yes
Block-Up Limit (each drum)	Yes	Yes
Bail Limits - Max and Min (each drum)	Yes	Yes
Rated Capacity Indicator/Limiter	Yes	Yes
Luffing Jib Maximum Up 1	Yes	Yes
Luffing Jib Maximum UP 2 ¹	Yes	Yes
Luffing Jib Down 1	Yes	Yes
Luffing Jib Down 2 ²	N/A	N/A

¹ Only when boom is below 50°.² Cannot be by-passed.

7 – Digital Display

Displays boom angle, luffing jib angle, and boom to luffing jib angle. See Figure 3-5 for identification of each angle:

- **Boom Angle** – angle between center line of boom and horizontal. Monitor this angle when raising boom to operating angle.

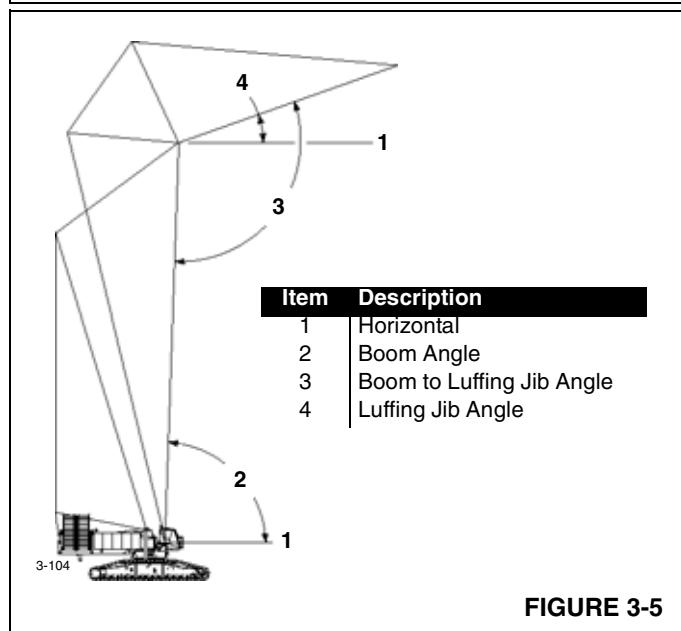
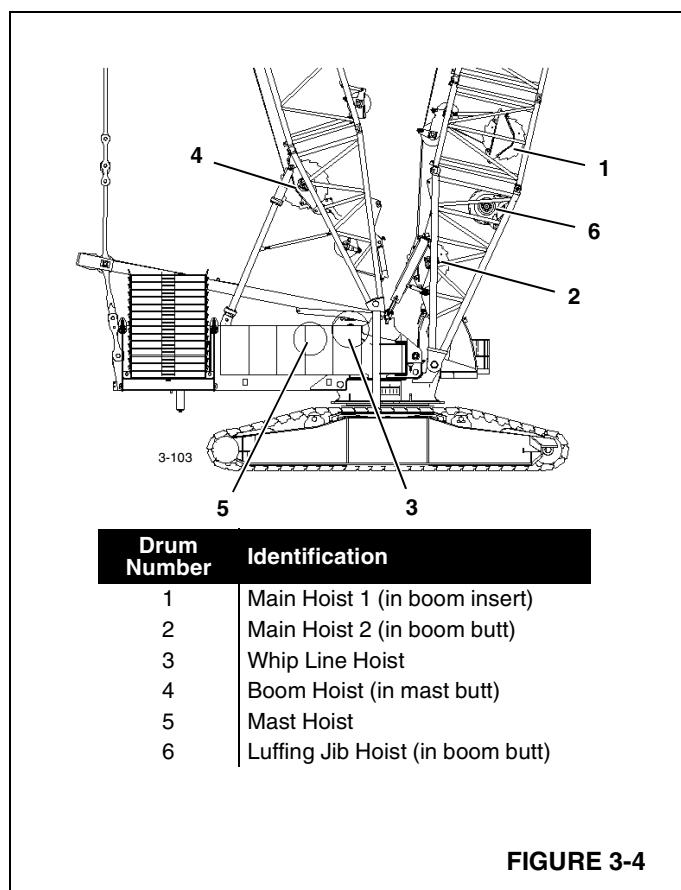
Adjust automatic boom stop to proper angle when operating with luffing jib. See Automatic Boom Stop in Section 6 of this manual for adjustment procedure.

- 85° for #44 or #79A Luffing Jib on 140-180 ft (42,7-54,9 m) of #55-79A or #55 Boom.

- 87° for #44 or #79A Luffing Jib on 200-340 ft (61,0-103,6 m) of #55-79A or #55 Boom.

- **Luffing Jib Angle** – angle between center line of jib and horizontal. Monitor this angle when raising and lowering jib during operation.
- **Boom to Luffing Jib Angle** – angle between center line of boom and center line of jib. Monitor this angle when raising boom and jib from ground and lowering boom and jib to ground.

The digital display also displays system faults and operating limits for the luffing hoist and all other crane functions. See Digital Display Readings in the Crane Operator's Manual for a complete list of operating conditions, system faults, and operating limits.



8 – Mechanical Boom Angle Indicator

Shows the angle of the boom in degrees above horizontal. The boom and luffing jib angles can also be viewed in display screen.

9 – Mechanical Level

Indicates crane levelness from front to rear and from side to side. Crane levelness can also be viewed in display screen.

Automatic Jib Stop (not shown)

When an automatic jib stop is reached, the luffing hoist stops automatically (brake spring applies) and is inoperable. The operating limit alert (yellow light and buzzer) comes on and the digital display indicates which limit has been reached.

Three jib stop limits are provided:

- **Luffing Jib Max Up 1** (maximum working angle) which automatically stops the luffing hoist when the boom to luffing jib angle is 168°.

The appropriate limit bypass switch must be turned to the bypass position to allow the jib to be raised an additional 1.2 to 2° to LUFFING JIB MAX UP 2 limit.

- **Luffing Jib Max Up 2** (maximum angle) which automatically stops the luffing hoist when the boom to luffing jib angle is 169.2° to 170.

This limit can be bypassed with the limit bypass switch *only when the attachment is lowered to ground (boom below 50°)*.

The luffing jib can be lowered after either limit is contacted.

WARNING Falling Boom/Jib Hazard!

Do not raise luffing jib above Max Up 2 limit. Structural damage will occur, possibly causing boom and luffing jib to be pulled over backwards.

Make sure luffing jib limits are enabled for normal operation (bypass switch turned counterclockwise).

- **Luffing Jib Down** limit which automatically stops the luffing hoist when the boom to luffing jib angle is 70°.

This limit cannot be bypassed.

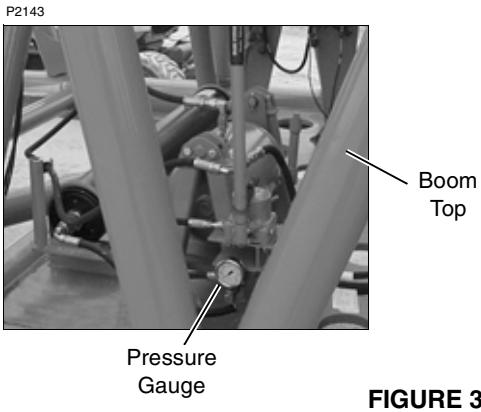
The luffing jib can be raised after the limit is contacted.

WARNING Falling Boom/Jib Hazard!

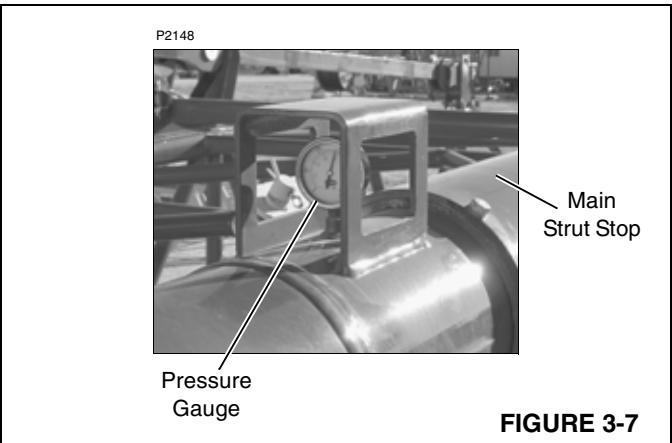
Do not lower luffing jib below down limit. Structural damage will occur, possibly causing boom and luffing jib to collapse.

OPERATING PRECAUTIONS

1. Read and comply with instructions in Liftcrane Luffing Jib Capacity Charts provided with luffing jib attachment. Do not operate beyond limits given in capacity charts.
Make sure proper counterweight is installed on crane and MAX-ER (if equipped).
2. Read and comply with instructions in this manual and in Crane Operator's Manual.
3. Read and comply with Maximum Allowable Travel Specifications in Luffing Jib Capacity Chart Manual.
4. Make sure luffing jib attachment is installed properly. Read and comply with instructions in Section 4 of this manual.
5. Before raising boom and jib, verify that pressure in jib stop positioner hydraulic system (see Figure 3-6) is at proper setting. For detailed instructions, see Section 4 in this manual.



6. Before raising boom and jib, verify that pressure in main strut stop cylinders (Figure 3-7). is at proper setting. For detailed instructions, see Section 4 of this manual. If pressure is not within specified range, contact Manitowoc Service Department for assistance.
7. Make sure all safety devices — block-up limits, boom and jib angle indicators, boom and jib stops, rated capacity indicator/limiter — are installed and operating properly. See Section 6 of this manual.
Make sure proper luffing jib capacity chart is selected to turn on luffing jib mode.
8. Raise and lower attachment as instructed in Section 4 of this manual.
9. Perform all operations with crane on a firm, level, uniformly supporting surface. Crane must be level to within 1 ft (0.3 m) in 100 ft (3.1 m).



10. Operate all crane functions slowly and smoothly. Avoid sudden starts and stops which could side load or shock load attachment.
11. Do not operate if wind exceeds allowable limits given in Capacity Charts provided with crane and luffing jib.

WIND CONDITIONS

Wind adversely affects lifting capacity and stability. The result could be loss of control over the load and crane, even if the load is within the crane's capacity.



WARNING

Tipping Crane Hazard!

Judgment and experience of qualified operators, job planners, and supervisors must be used to compensate for affect of wind on lifted load and boom by reducing ratings or operating speeds, or a combination of both.

Failing to observe this precaution can cause crane to tip or boom and/or jib to collapse. Death or serious injury to personnel can result.

Wind speed (to include wind gusts) must be monitored by job planners and supervisors.

Wind speed at the boom or jib point can be greater than wind speed at ground level. Also be aware that the larger the sail area of the load, the greater the wind's affect on the load.

As a general rule, ratings and operating speeds must be reduced when:

Wind causes load to swing forward past allowable operating radius or sideways past either boom hinge pin.

#44 Luffing Jib on #55-79A Boom with 100 foot (30,5 m) Mast

Operation Permitted

Operation is permitted in steady winds or wind gusts up to the maximum speed given in Table 3-2, provided ratings are reduced the specified amount.

Operation Not Permitted

Operation is not permitted in the areas indicated in Table 3-2. Observe the following options:

Boom with 70 - 180 ft (21,3 - 54,9 m) Luffing Jib

- **Up to 50 mph (22 m/s)** -

Park crane (upper in line with crawlers) with load blocks and weight balls on ground or secured and position boom at 75° and luffing jib at 50°.

- **50 mph (22 m/s) and Above** -

Lower boom and luffing jib onto blocking at ground level.

Boom with 190 - 240 ft (57,9 - 73,2 m) Luffing Jib

- **Up to 40 mph (18 m/s)** -

Park crane (upper in line with crawlers) with load blocks and weight balls on ground or secured and position boom at 75° and luffing jib at 50°.

- **40 mph (18 m/s) and Above** -

Lower boom and luffing jib onto blocking at ground level.

Mast

- **Above 50 mph (22 m/s)** -

Haul in boom hoist wire rope just enough to tension mast straps. Do not raise boom off blocking. **Wind can cause mast stops to collapse if this step is not performed.**

- **Above 75 mph (34 m/s)** -

Lower mast onto blocking at ground level.

Table 3-2

Rating Reductions for Various Wind Speeds and Wind Gusts

Luffing Jib Length ft (m)		70-120 (21,3-36,6)			130-180 (39,6-54,9)			190-240 (57,9-73,2)		
Boom Length ft (m)		140-180 (42,7-54,9)	200-240 (61,0-73,2)	260-280 (79,2-85,3)	140-180 (42,7-54,9)	200-240 (61,0-73,2)	260-280 (79,2-85,3)	140-180 (42,7-54,9)	200-240 (61,0-73,2)	260-280 (79,2-85,3)
Maximum Wind Speed		Percent Rating Reduction								
mph	m/s	0	0	0	0	0	0	0	0	0
15	7	0	0	0	0	0	0	0	0	0
20	9	0	0	0	0	0	0	0	0	10
25	11	0	0	0	0	0	0	0	10	50
30	13	0	0	10	0	0	30	10	60	
35	16	0	0	10	0	20	60	20		
Above 35 mph (16 m/s)		OPERATION NOT PERMITTED								

For luffing jib operation in winds above 15 mph (7 m/s) with luffing jib positioned above 50°, load block from luffing jib point must weigh at least 15,000 lb (6804 kg). **Luffing jib may be blown over backwards if this precaution is not observed.** See luffing jib capacity chart for specific backward stability conditions.

#79A Luffing Jib on #55 or #55A Boom without MAX-ER Attachment

Operation Permitted

Operation is permitted in steady winds or wind gusts up to the maximum speed given in Table 3-3, provided ratings are reduced the specified amount.

Operation Not Permitted

Operation is not permitted in the areas indicated in Table 3-3. Observe the following options:

Boom with 90 - 230 ft (27,4 - 70,1 m) Luffing Jib without MAX-ER

- **Up to 50 mph (22 m/s)** -

Park crane (upper in line with crawlers) with load block on ground or secured and position boom at 85° and luffing jib at 55°.

- **50 mph (22 m/s) and Above** -

Lower attachment onto blocking at ground level.

Boom with 250 - 310 ft (76,2 - 94,5 m) Luffing Jib without MAX-ER

- **Up to 40 mph (18 m/s)** -

Park crane (upper in line with crawlers) with load block on ground or secured and position boom at 85° and luffing jib at 60°.

- **40 mph (18 m/s) and Above** -

Lower attachment onto blocking at ground level.

Mast

- **Above 50 mph (22 m/s)** -

Haul in boom hoist wire rope just enough to tension mast straps. Do not raise boom off blocking. **Wind can cause mast stops to collapse if this step is not performed.**

- **Above 75 mph (34 m/s)** -

Lower mast onto blocking at ground level.

Table 3-3

Rating Reductions for Various Wind Speeds and Wind Gusts

Luffing Jib Length ft (m)		90-150 (27,4-45,7)	170-230 (51,8-70,1)	250-310 (76,2-94,5)
Boom Length ft (m)		160-200 (48,8-61,0)	160-200 (48,8-61,0)	160-180 (48,9-54,9)
Maximum Wind Speed mph	m/s	Percent Rating Reduction		
15	7	0	0	0
20	9	0	0	10
25	11	0	0	60
30	13	0	30	
35	16	0	60	
Above 35 mph (16 m/s)		OPERATION NOT PERMITTED		

Wind speed to be measured at or above boom point elevation. See Luffing Jib Capacity Chart for specific backward stability conditions.

79A Luffing Jib on #55 or #55A Boom with MAX-ER Attachment

Operation Permitted

Operation is permitted in steady winds or wind gusts up to the maximum speed given in Table 3-4, provided ratings are reduced the specified amount.

Operation Not Permitted

Operation is not permitted in the areas indicated in Table 3-4. Observe the following options:

Boom with 90 - 150 ft (27,4 - 45,7 m) Luffing Jib with MAX-ER Attachment

- **Up to 50 mph (22 m/s)** -

Park crane (upper in line with crawlers) with load block on ground or secured and position boom at 75° and luffing jib at 45°.

- **50 mph (22 m/s) and Above** -

Lower boom and luffing jib onto blocking at ground level.

Boom with 170 - 230 ft (51,8 - 70,1 m) Luffing Jib with MAX-ER Attachment

- **Up to 40 mph (18 m/s)** -

Park crane (upper in line with crawlers) with load block on ground or secured and position boom at 75° and luffing jib at 55°.

- **40 mph (18 m/s) and Above** -

Lower boom and luffing jib onto blocking at ground level.

Boom with 250 - 310 ft (76,2 - 94,5 m) Luffing Jib with MAX-ER Attachment

- **Up to 30 mph (13 m/s)** -

Park crane (upper in line with crawlers) with load block on ground or secured and position boom at 75° and luffing jib at 55°.

- **30 mph (13 m/s) and Above** -

Lower boom and luffing jib onto blocking at ground level.

Mast

- **Above 50 mph (22 m/s)** -

Haul in boom hoist wire rope just enough to tension mast straps. Do not raise boom off blocking. **Wind can cause mast stops to collapse if this step is not performed.**

- **Above 75 mph (34 m/s)** -

Lower mast onto blocking at ground level.

Table 3-4

Rating Reductions for Various Wind Speeds and Wind Gusts

Luffing Jib Length ft (m)		90-150 (27,4-45,7)			170-230 (51,8-70,1)			250-310 (76,2-94,5)			
Boom Length ft (m)		160-220 (48,8-67,1)	240-280 (73,2-85,3)	300-340 (91,4-103,6)	160-220 (48,8-67,1)	240-280 (73,2-85,3)	300-340 (91,4-103,6)	160-220 (48,8-67,1)	240-280 (73,2-85,3)	300-340 (91,4-103,6)	
Maximum Wind Speed mph	m/s	Percent Rating Reduction									
15	7	0	0	0	0	0	0	0	0	0	
20	9	0	0	0	0	0	10	10	40	60	
25	11	0	0	0	0	20	50	60			
30	13	0	0	10	30	60					
35	16	0	10	30	60						
Above 35 mph (16 m/s)											

OPERATION NOT PERMITTED

Wind speed to be measured at or above boom point elevation. See Luffing Jib Capacity Chart for specific backward stability conditions.

SECTION 4

SET-UP AND INSTALLATION

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SECTION 4

SETUP AND INSTALLATION



WARNING

Avoid Death or Serious injury!

Read and understand instructions in this section before attempting to install or remove attachment.

Moving Parts/Pinch Points!

Avoid death or crushing injury during crane assembly and disassembly:

- Assembly personnel – take every precaution to prevent injury when working near moving parts.
- Maintain communication between operator and assemblers to avoid accidents.

KEEP UNAUTHORIZED PERSONNEL WELL CLEAR OF CRANE.

Falling Load Hazard!

To prevent lifting equipment from failing and load from dropping, crane owner/user shall verify following prior to each lift:

- All lifting equipment (shackles, hooks, slings, blocks) has been properly maintained and is safe for use.
- All lifting equipment has a capacity equal to or greater than load to be lifted.

GENERAL SETUP AND INSTALLATION

This section contains installation and removal instructions for the luffing jib attachments available for the Model 18000: #44 and #79A.

For the remainder of this section, luffing jib attachment is referred to as *jib* or *attachment*.

The instructions in this section assume that the crane, required length of boom and mast, and MAX-ER attachment (if required) are already installed and ready for luffing jib installation.

For #44 Jib, the crane must be rigged as follows:

- #55-79A boom.
- 100 ft (30,5 m) mast.
- No MAX-ER attachment.

For #79A Jib, the crane must be rigged as follows:

- #55 or 55A boom.
- 100 ft (30,5 m) mast without MAX-ER attachment.
- 140 ft (42,7 m) mast with MAX-ER attachment.

The attachment shall be installed, operated, and removed by experienced personnel trained in the operation and erection of construction cranes. These personnel shall read, understand, and comply with the instructions in this section, in the Luffing Jib Rigging Drawing, and in the Liftcrane Luffing Jib Capacity Charts provided with the attachment.

Contact your Manitowoc Crane Care distributor for a detailed explanation of any procedure not fully understood.

The installation/removal area must be firm, level, and free of ground and overhead obstructions.

Level = 1% of grade or 1 ft (0,03 m) in 100 ft (30,5 m).

The area selected must be large enough to accommodate the crane, selected boom and jib length, and movement of an assist crane.

For #44 Jib:

- The maximum combined boom and jib length is 520 ft (158,5 m).
- The minimum boom length for use with the jib is 140 ft (42,7 m). See the capacity chart for boom and jib length limitations.

For #79A Jib:

- The maximum combined boom and jib length is 650 ft (198,1 m).
- The minimum boom length for use with the jib is 160 ft (48,8 m). See the capacity chart for boom and jib length limitations.

To allow movement of aerial work platforms and an assist crane, there must be a minimum of 35 ft (6,1 m) clearance on both sides of the boom and jib.

4

CRANE ORIENTATION

The terms RIGHT, LEFT, FRONT, REAR used in this section see the operator's right, left, front, and rear sides when seated in the operator's cab looking forward with the crawler motors to the rear.

ACCESSING PARTS

Some parts of the crane, boom, and jib cannot be reached from the ground. Take necessary precautions to prevent falling off the crane, boom, or jib during assembly and disassembly. ***Falling from any elevation could result in serious injury or death.***

Owner/user shall provide approved ladders or aerial work platforms so workers can safely access those areas of crane, boom, and jib that cannot be reached from ground.



Adhere to local, state, and federal regulations for handling personnel and for personnel fall protection

Do not use top of boom or jib as walkways.

Optional boom ladders (stored in boom butt) are available from Manitowoc. If your crane has ladders, see Section 3 in Operator's Manual provided with crane.

CRANE WEIGHTS

See Crane Weights in Section 1 of this manual for the weights of the individual boom and jib components.

OPERATING CONTROLS

Become thoroughly familiar with the location and function of all operating controls provided for the crane and attachment. Read and understand the instructions in Section 3 of this manual.

COUNTERWEIGHT REQUIREMENT

See applicable Luffing Jib Capacity Charts and Raising Procedure Charts for counterweight requirements when operating with jib.



Tipping Hazard!

Prevent crane from tipping. Do not operate crane until proper counterweight is installed.

BLOCKED CRAWLERS

To prevent crane from tipping or structural damage to attachment, ***all boom and jib combinations must be raised and lowered over blocked crawlers.*** See Luffing Jib Capacity Charts and Raising Procedure Charts for blocked crawler requirements. Also see Crawler Blocking Diagram in Luffing Jib Capacity Chart Manual for instructions.



DANGER

Tipping Hazard!

Prevent crane from tipping or structural damage to attachment. Do not attempt to raise or lower boom and jib from or to ground until crawlers are blocked.

RIGGING DRAWINGS

See the end of this section for applicable jib rigging drawings.

The boom and jib components (butts, inserts, tops, pendants, straps) must be assembled in proper sequence according to the rigging drawings.

Two tables are provided on the luffing jib rigging drawing: one table lists the boom sections and backstay pendants required for various boom lengths; the other table lists the boom sections required for various jib lengths. *Make sure proper table is referred to.* Read and comply with insert and pendant notes on the rigging drawing.

LUFFING JIB RAISING PROCEDURE

See the Luffing Jib Capacity Chart Manual for applicable luffing jib raising and lowering procedures.

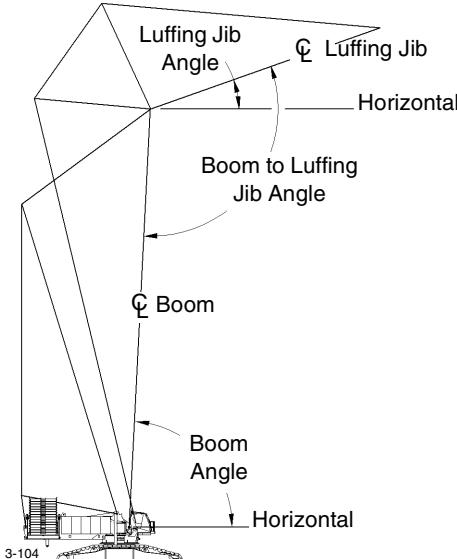


FIGURE 4-1

IDENTIFYING JIB COMPONENTS

Jib sections are marked for proper identification as shown in Figure 4-4, View A (all four chords of each boom or jib section).

Straps and connecting links are marked for proper identification as shown in Figure 4-4, View B.

Pendants (when used) are marked for proper identification as shown in Figure 4-4, View C.

HANDLING COMPONENTS

Handle boom and jib components with care to avoid damaging lacings and chords. *Lift against chords only, never against lacings.*

Nylon slings should be used to handle components. If wire rope or chain slings are used, protective covering (such as sections of rubber tire) must be used between the slings and the component.

RETAINING CONNECTING PINS

Connecting pins are retained in various ways:

- Snap pins.
- Quick-release pins.
- Cotter pins.
- Keeper plates with cap screws and lock washers.

Do not operate crane until all connecting pins are installed and properly retained.

SHIPPING CRANE COMPONENTS

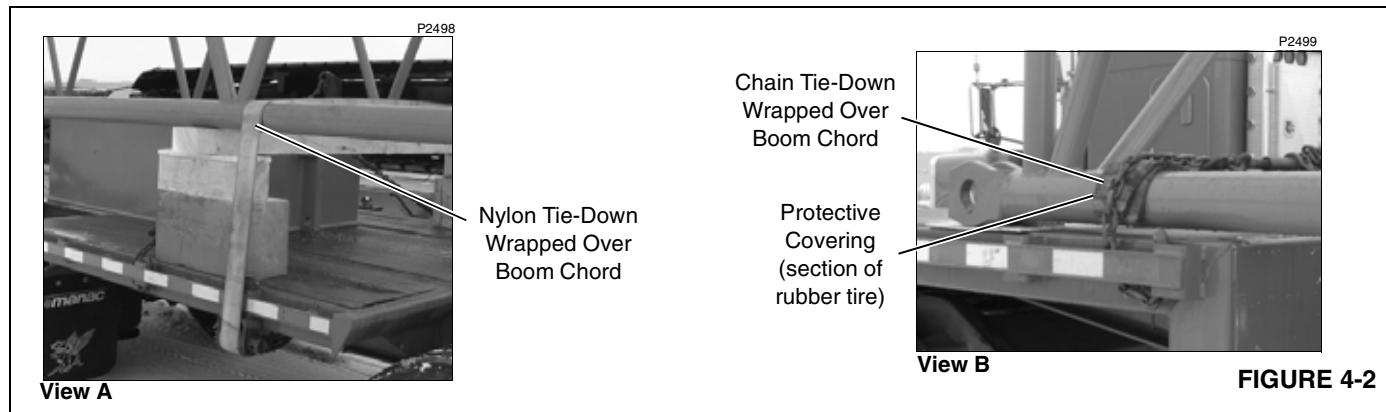
It is the owner/user's responsibility to ensure the following:

- That all trailer loads comply with local, state, and federal transportation requirements.
- ***That all crane components are properly blocked and secured so they cannot shift or fall off trailers.***
- To avoid damage to components:

Use nylon tie-downs to secure components as shown in Figure 4-2, View A.

If chain tie-downs are used, install protective covering (sections of rubber tire) between chain and component being secured as shown in Figure 4-2, View B.

When securing boom sections, wrap tie-downs over chords — never over lacings. Keep tie-downs as close to blocking as possible (View A) to prevent bending of chords.

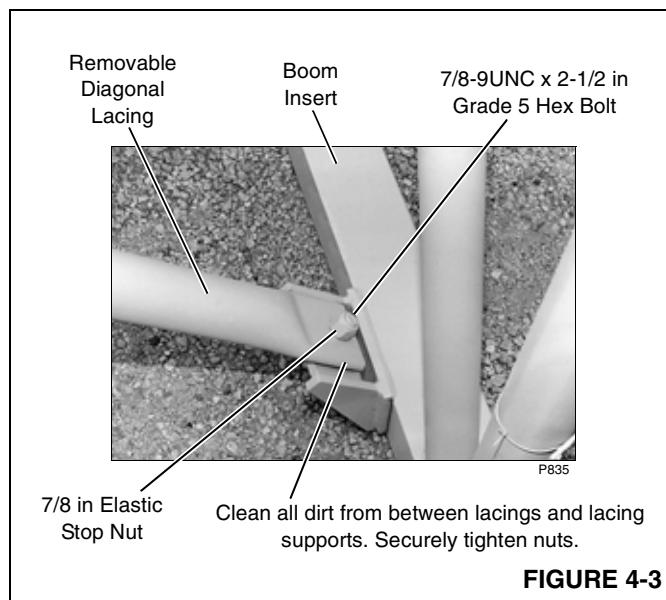


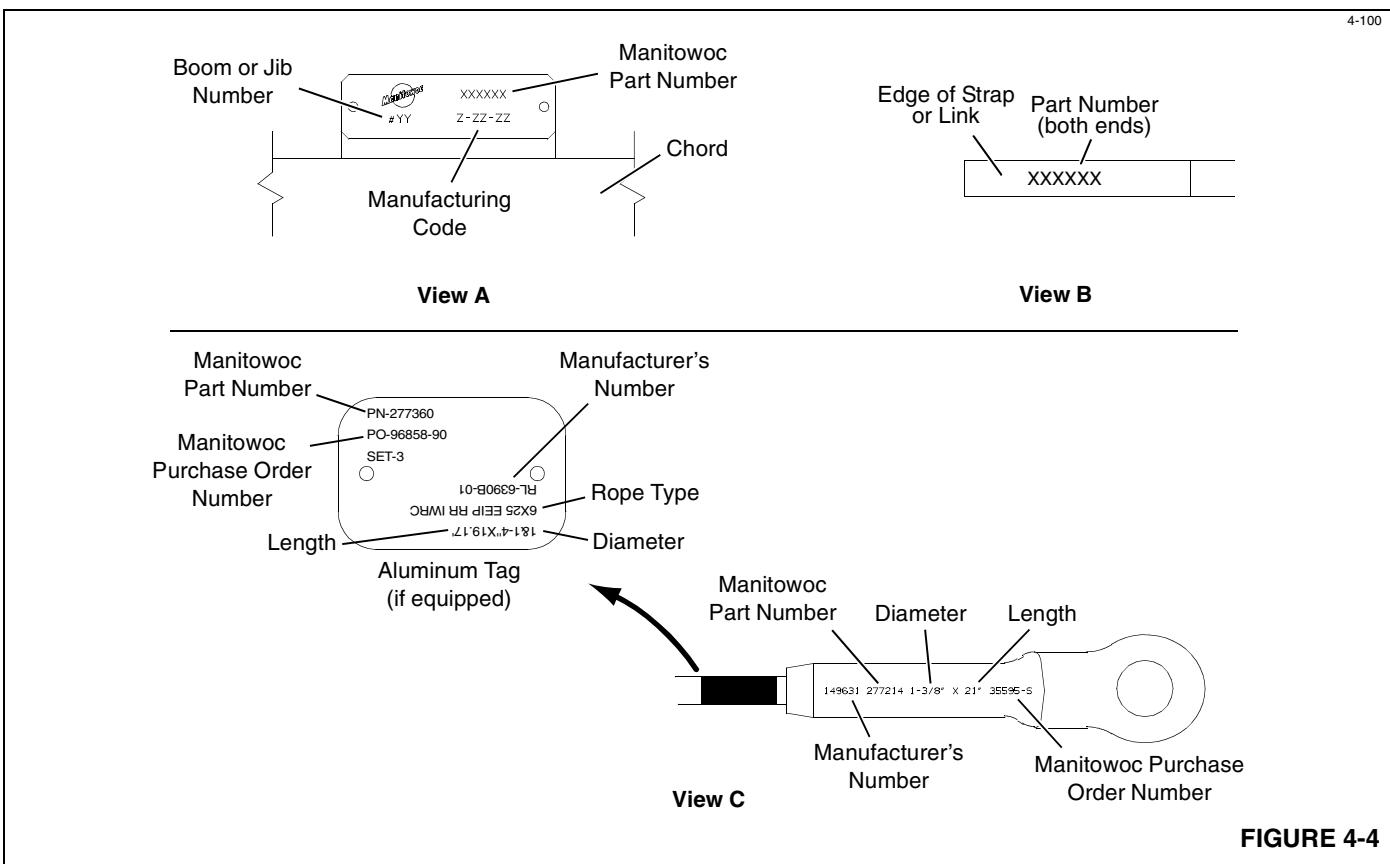
REMOVABLE LACINGS – #44 JIB

The 20 ft (6,1 m) and standard 40 ft (12,2 m) #44 inserts have removable diagonal lacings. These lacings may be removed to allow for storage of other components during shipping.

If removed, ***removable diagonal lacings must be reinstalled before operating crane.***

1. Thoroughly clean all dirt from mating surfaces between lacings and supports on inserts.
2. Reinstall proper number of removable lacings in each insert with bolts and stop nuts as shown in Figure 4-4.
3. Securely tighten nuts.





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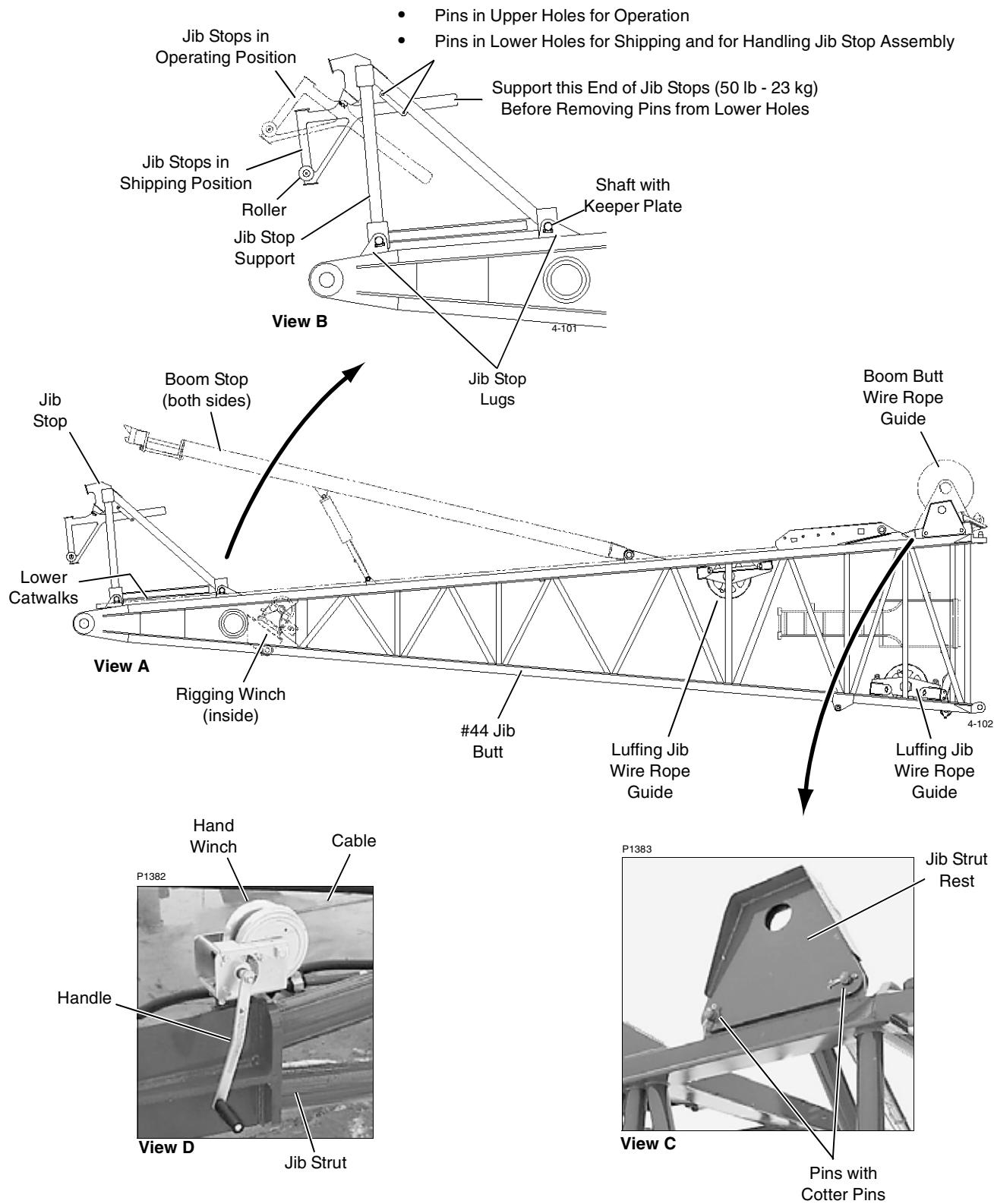


FIGURE 4-5

LUFFING JIB RIGGING GUIDE – #44

General

The following installation, raising, lowering, and removal instructions apply to the #44 luffing jib mounted on a #55-79A.

Assist Crane Requirements

Either the Model 18000 or an assist crane can be used to install and remove the jib. If the Model 18000 is used, it must be in the setup configuration (same as when installing counterweights and crawler or assembling boom) – see Crane Assembly in Crane Operator's Manual for detailed instructions and capacity limitations.

The jib butt, jib strut, and main strut are shipped from Manitowoc as an assembled unit. The assembly weighs approximately 23,250 lb (10 500 kg) and is the heaviest load to be lifted. **Size assist crane accordingly.**

Instructions in this section assume an assist crane will be used.

To allow for the set-up of an assist crane, there should be a minimum of 35 ft (10,7 m) clearance on one side of the boom.

Installing #44 Luffing Jib

Lower Boom

1. If specified in raising procedure chart, travel front crawler rollers onto blocking.
2. Swing upper slightly to either side and lower load block and weight ball onto ground.
3. Swing boom in-line with crawlers and lower boom point onto blocking approximately 54 in (1,4 m) high as shown in Figure 4-5, View A. This will allow you to assemble jib on blocking approximately 6 in (152 mm) high.

Prepare Boom and Jib

1. Remove load block from boom point.
2. Remove upper boom point, if equipped.

3. Change boom length as necessary to meet job requirements.

Note that 40 ft (12,2 m) insert with luffing hoist guide sheaves must be installed next to 10 ft (3,1 m) insert which is next to boom butt.

4. Check that all boom inserts and straps are assembled in proper sequence according to rigging drawing.



WARNING

Tipping Hazard!

Crane can tip if step 5 is not performed if required.

5. If specified in raising procedure chart, remove following items:
 - Lower boom point from #79A boom top.
 - Rigging winch and luffing jib wire rope guides from #44 butt.
6. Add or remove crane counterweight to comply with applicable capacity chart.
7. Remove boom stops, lower catwalk, and wire rope guide from #44 butt.
8. Modify #44 butt for use as jib butt as shown on modification drawings.
9. Attach jib stop assembly to lugs on jib butt with shafts and keepers plates (Figure 4-5, View B).
 - a. Support jib stops at point shown (50 lb - 23 kg).
 - b. Remove pins from lower holes and install them in upper holes (operating position).
 - c. Lower jib stops to operating position.
10. Pin jib strut rest to lugs on jib butt (Figure 4-5, View C).
11. Attach hand winches to jib strut if necessary (Figure 4-5, View D).
 - a. If necessary, install cables and attach to adjustable straps.
 - b. Install handles if removed for shipping.

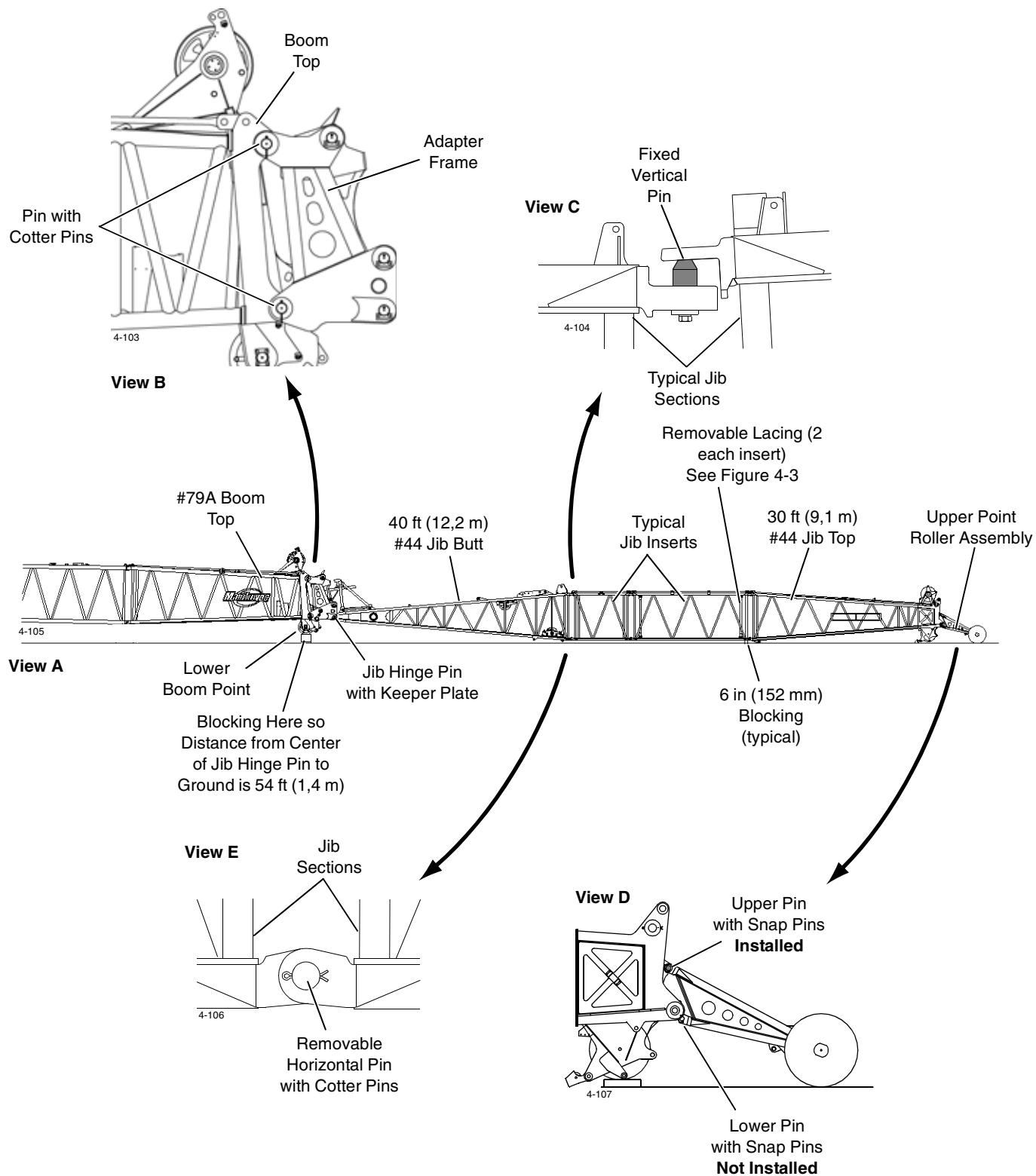


FIGURE 4-6

Install Jib Butt

See Figure 4-6 for following procedure.

1. Lift jib butt adapter frame into position at end of boom top and pin to boom top lugs (View B).
2. Lift jib butt into position at end of boom top (View A).

Pin jib butt to lugs on boom top with hinge pins. *Install washers as pins are inserted to limit jib butt side play to 1/8 in (3 mm).*

3. Lower jib butt onto blocking approximately 6 in (152 mm) high.

Install Jib Inserts and Top

See Figure 4-6 for following procedure.

1. Determine jib length required for lift to be made.

**WARNING****Collapsing Jib Hazard!**

Install removable lacings, if removed, before raising jib.

2. Check that removable diagonal lacings are securely fastened to each jib insert (see Removable Lacings – #44 Jib topic and Figure 4-4).
3. Assemble jib inserts *in proper sequence — shortest inserts nearest butt* (see Luffing Jib Assembly Rigging drawing):
 - a. Lift insert into position and engage top connector holes in insert with fixed vertical pins in butt as shown in View C.
 - b. Lower insert until bottom connector holes are aligned and install removable horizontal pins as shown in View E.
 - c. Install blocking approximately 6 in (152 mm) high under top end of insert.
 - d. Repeat steps 3a – 3c until all inserts and jib top have been installed.
4. Lift upper point roller assembly into position at end of boom top. Pin top connecting holes in upper point to boom top (View D).

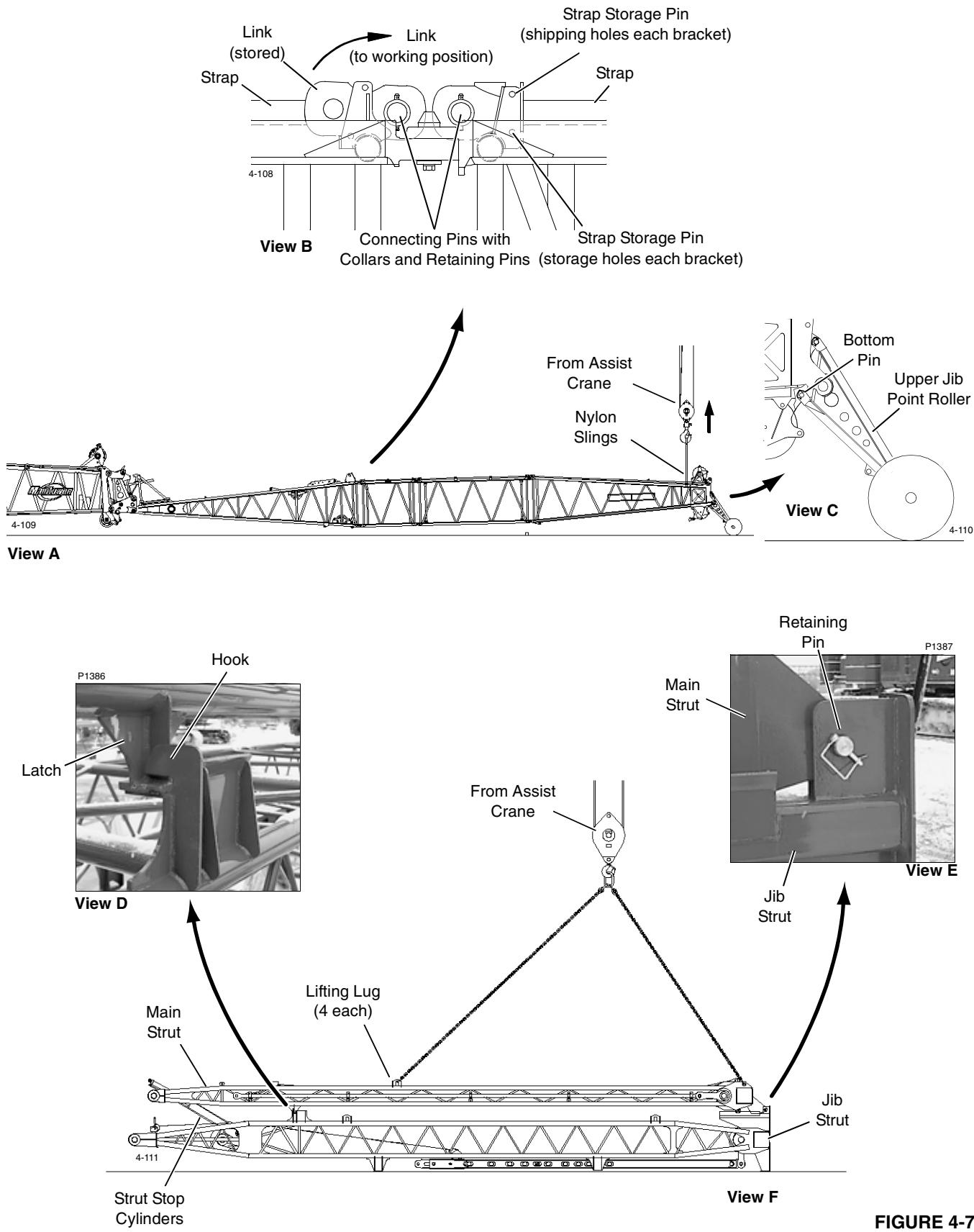


FIGURE 4-7

Complete Upper Jib Point Roller Installation

See Figure 4-7 for following procedure.

1. Attach nylon slings from assist crane to top chords at top end of jib top (View A).

NOTE: Assist crane must have sufficient capacity to lift weight of assembled jib.

2. Slowly lift jib top until bottom holes in upper jib point roller are aligned with holes in jib top.
3. Insert bottom pins to connect upper jib point roller to jib top (View C).
4. Lower jib top until rollers are on ground.
5. Disconnect slings from jib top.

Connect Jib Straps

See Figure 4-7, View B for following procedure.

Jib straps and links are stored on the inserts and jib top for shipping.

1. Remove strap storage pins from shipping holes and install in storage holes.
2. Remove retaining pins, collars, and connecting pins from end of straps on adjacent insert.

3. Rotate links from storage position to working position.
4. Install connecting pins, collars, and retaining pins to connect links to adjacent straps.
5. Repeat steps at end of each insert.

Install Struts

See Figure 4-7 for following procedure.

1. The main strut, jib strut, and adjustable straps can be shipped as an assembled unit to reduce shipping space. If struts are assembled, proceed as follows:
 - a. Connect chain slings from assist crane to four lifting lugs on main strut (View F).
 - b. Lift strut assembly off transport trailer and place assembly on ground.
 - c. Remove retaining pins connecting main strut to jib strut (View E). Store pins in jib strut holes once main strut is removed.
If necessary, lift main strut slightly to loosen pins.
 - d. Lift main strut slightly so that it just lifts off jib strut at hook and latch (View D).
 - e. Swing, boom, and hoist assist crane as required to disengage latch on main strut from hook on jib strut.
Use care not to hit strut stop cylinders with main strut.
 - f. Place main strut on blocking and disconnect slings.

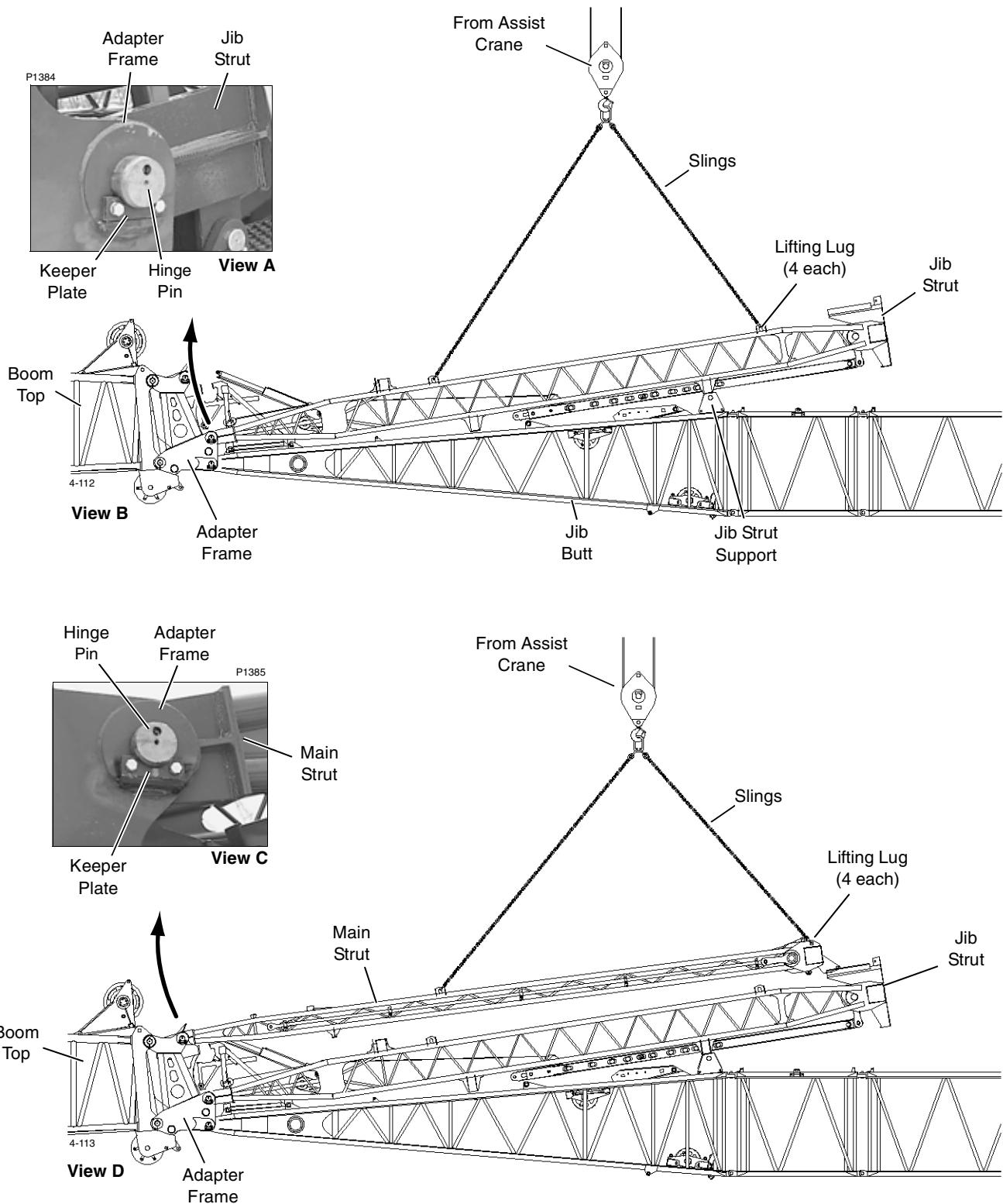


FIGURE 4-8

See Figure 4-8 for following procedure.

2. Install jib strut, as follows:

- a. Connect chain slings from assist crane to four lifting lugs on main strut (View B).

Adjust length of rear chain slings so rear end of strut hangs at least 8 ft (2,4 m) lower than top end of strut.

- b. Lift jib strut into position at end of adapter frame and align connecting holes.
- c. Pin jib strut to adapter frame and install keeper plates (View A).

As pins are installed, install washers to ***limit side play of jib strut to 1/8 in (3,2 mm)***.

- d. Disconnect slings from jib strut.

3. Install main strut, as follows:

- a. Connect chain slings from assist crane to four lifting lugs on main strut (View D).

Adjust length of rear chain slings so rear end of strut hangs at least 8 ft (2,4 m) lower than top end of strut.

- b. Lift main strut into position at end of adapter frame and align connecting holes.
- c. Pin main strut to adapter frame and install keeper plates (View C).

As pins are installed, install washers to ***limit side play of main strut to 1/8 in (3 mm)***.

- d. Disconnect slings from main strut.

Install Luffing Hoist Wire Rope

1. Select and confirm LUFFING JIB mode.
2. Place reel of luffing hoist wire rope on ground along right side of jib near sheave end of struts.
3. Attach wire rope to sucker line, if installed in strut sheaves.

If sucker line is not installed, reeve free end of luffing hoist wire rope through strut sheaves and under guide sheave (right side) on boom top as shown in reeving diagram on rigging drawing.

4. Route free end of luffing hoist wire rope through guide sheaves in 40 ft (12,2 m) insert nearest boom butt.
5. Securely anchor free end of luffing hoist wire rope to luffing hoist drum with wedge provided (see Wire Rope Installation and Maintenance in this section).

Wire rope must spool off bottom of luffing hoist drum.

6. Tightly wind excess wire rope onto luffing hoist drum.
7. Anchor other end of luffing hoist wire rope to right side of main strut with socket and wedge provided (see Wire Rope Installation and Maintenance in this section).

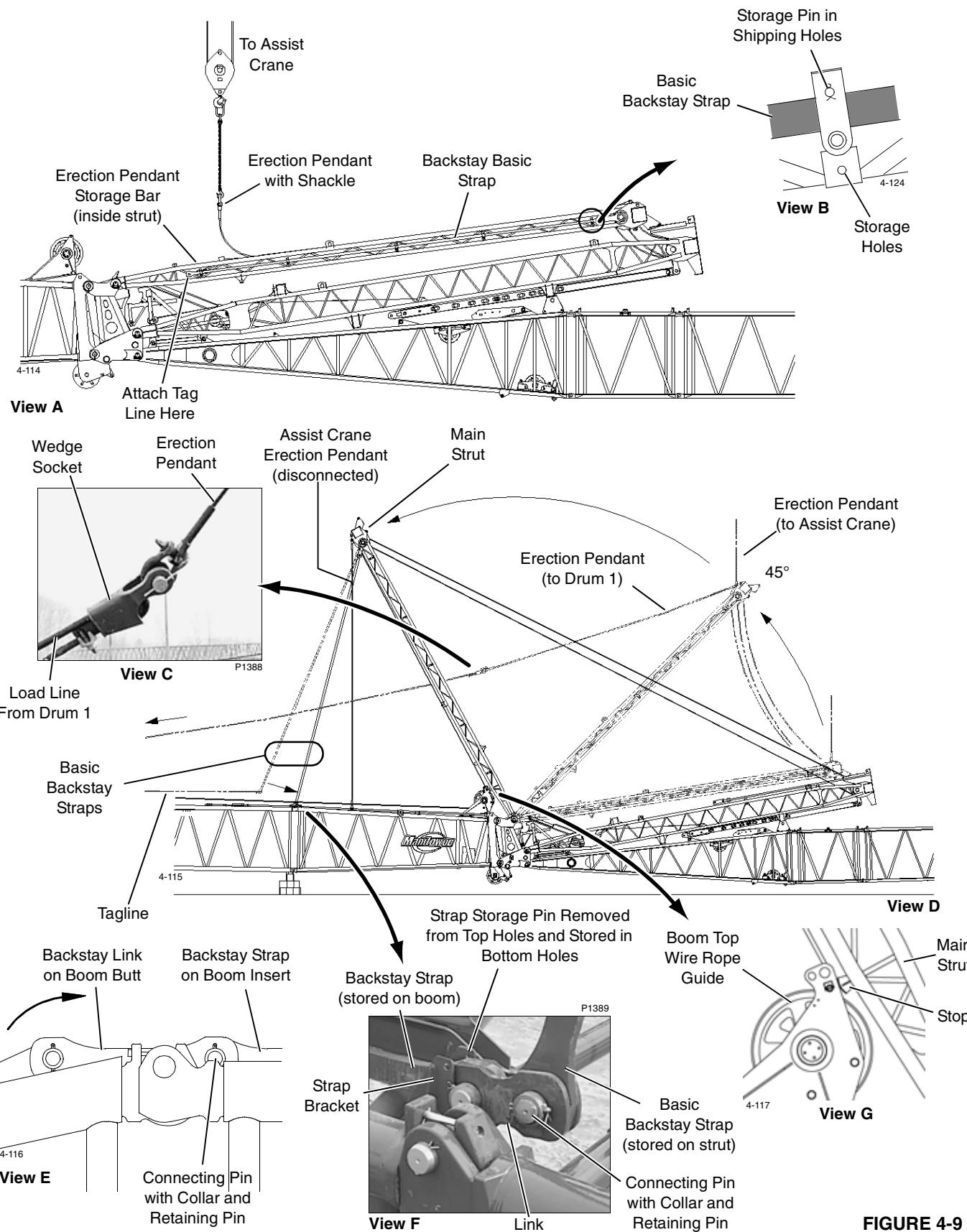


FIGURE 4-9

Raise Main Strut

See Figure 4-9 for following procedure.

**WARNING****Moving Part Hazard!**

Do not stand on boom top or jib butt while main strut is being raised or lowered.

Wait until main strut is stopped and supported by assist crane or luffing hoist line before climbing onto boom top or jib butt.

1. Remove backstay strap storage pins from shipping holes (View B) and install in storage holes.
Allow straps to rest in storage brackets.
2. Attach taglines to backstay basic straps. Taglines should be at least 20 ft (6 m) long.
3. Disconnect shackles on ends of strut erection pendants from storage bar in base of main strut.
Reconnect shackles to pendants.
4. Connect chain sling from assist crane to shackle on one erection pendant (View A).
5. Hoist and swing with assist crane so erection pendant is extended vertically above top of main strut.
6. Connect shackle on other erection pendant to load line from Drum 1 (View C).

CAUTION**Strut Damage!**

- Do not attempt to raise main strut with load line from Drum 1 until step 7 is performed. Structural damage to strut will occur.
 - Keep load line from assist crane centered over main strut while raising strut. Structural damage can occur if strut is side loaded.
7. Slowly haul in ***load line from assist crane*** to raise main strut. At same time pay out luffing hoist wire rope.
 8. Raise strut to at least 45° with assist crane and stop (view D).
 9. Slowly haul in load line from Drum 1 until load line is supporting strut.

10. Lower erection pendant from assist crane to vertical and disconnect assist crane.

11. Slowly haul in load line from Drum 1 to raise jib strut. Continue to pay out luffing jib hoist wire rope.

Operator must carefully match rate of speed that luffing hoist wire rope is payed out with speed that load line is hauled in.

Luffing hoist wire rope must remain slack until strut is raised to vertical.

CAUTION**Strut Damage!**

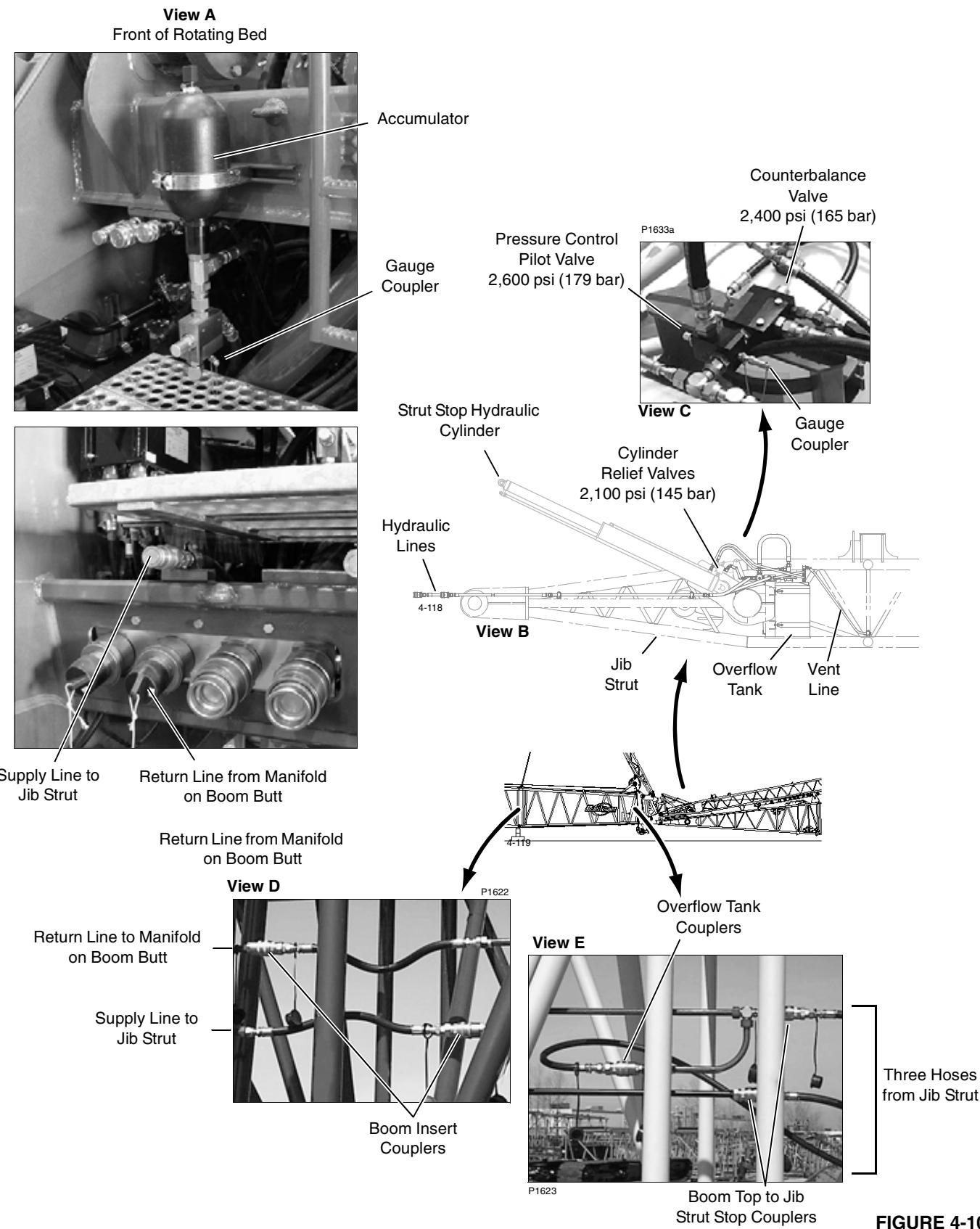
Too much tension in luffing hoist wire rope can cause structural damage to strut. Keep luffing hoist wire rope slack until strut nears vertical.

12. As strut nears vertical, haul in luffing hoist wire rope just enough so main strut moves smoothly past vertical.
Jib strut should not rise off jib butt during remaining steps.
13. Continue to slowly pay out luffing hoist wire rope to lower main strut. Keep load line from Drum 1 slack.
14. Have ground personnel use taglines to guide jib backstay straps so they do not hit boom lacings.
15. Stop lowering main strut when stops on strut are against side plates of boom top wire rope guide (View G).
16. Pay out load line from Drum 1 so erection pendant hangs vertically (View D) and disconnect load line (View C).

Connect Backstay Straps

See Figure 4-9, Views E and F for following procedure.

1. Remove strap storage pins from shipping position and store and in bottom holes in strap brackets.
2. Remove retaining pins, collars, and connecting pins from end of each basic backstay strap.
3. Rotate links from storage position to working position and pin to ends of basic backstay straps.
4. Repeat above steps for backstay links between each boom section.
5. See View E for connection of backstay link at boom butt.

**FIGURE 4-10**

Connect Hydraulic Hoses**CAUTION****Strut Damage**

If luffing jib will be operated when air temperature is below 32°F (0°C), drain and refill hydraulic systems (crane and boom) with Petro Canada Premium Plus hydraulic oil (MCC #549318). Be sure strut stop cylinders and supply lines are completely drained before refilling.

For operation below 10°F (-12°C) use a thinner fluid such as Petro Canada Premium Arctic 15 (MCC #A03745).

See Figure 4-10 for following procedure.

The strut stop hydraulic hoses have quick couplers with dust caps. The dust caps must be removed before making the connections.

1. Stop engine.

2. Connect luffing hoist hydraulic hoses (View A) between crane and boom butt.
3. Connect hoses between ends of boom inserts along entire length of boom (View D).

4. Connect hydraulic hoses from jib strut to couplers on boom top (View E).

5. Start engine.

6. Strut stop cylinders should fully extend, if not already done.

7. Check fluid level in overflow tank. Tank should be empty.

If tank is not empty, possible causes include:

- Wrong oil viscosity for cold weather operation (see CAUTION above).
- Drain line hydraulic connections not made.
- Bent or kinked drain line blocking oil flow.
- Drain line check valve on transition insert incorrectly installed.

8. Attach an accurate hydraulic pressure gauge to coupler at accumulator on front of rotating bed (View A). Verify that system pressure is 2,900 psi (200 bar).

All other valves are preset to pressure settings given in Views B and C.

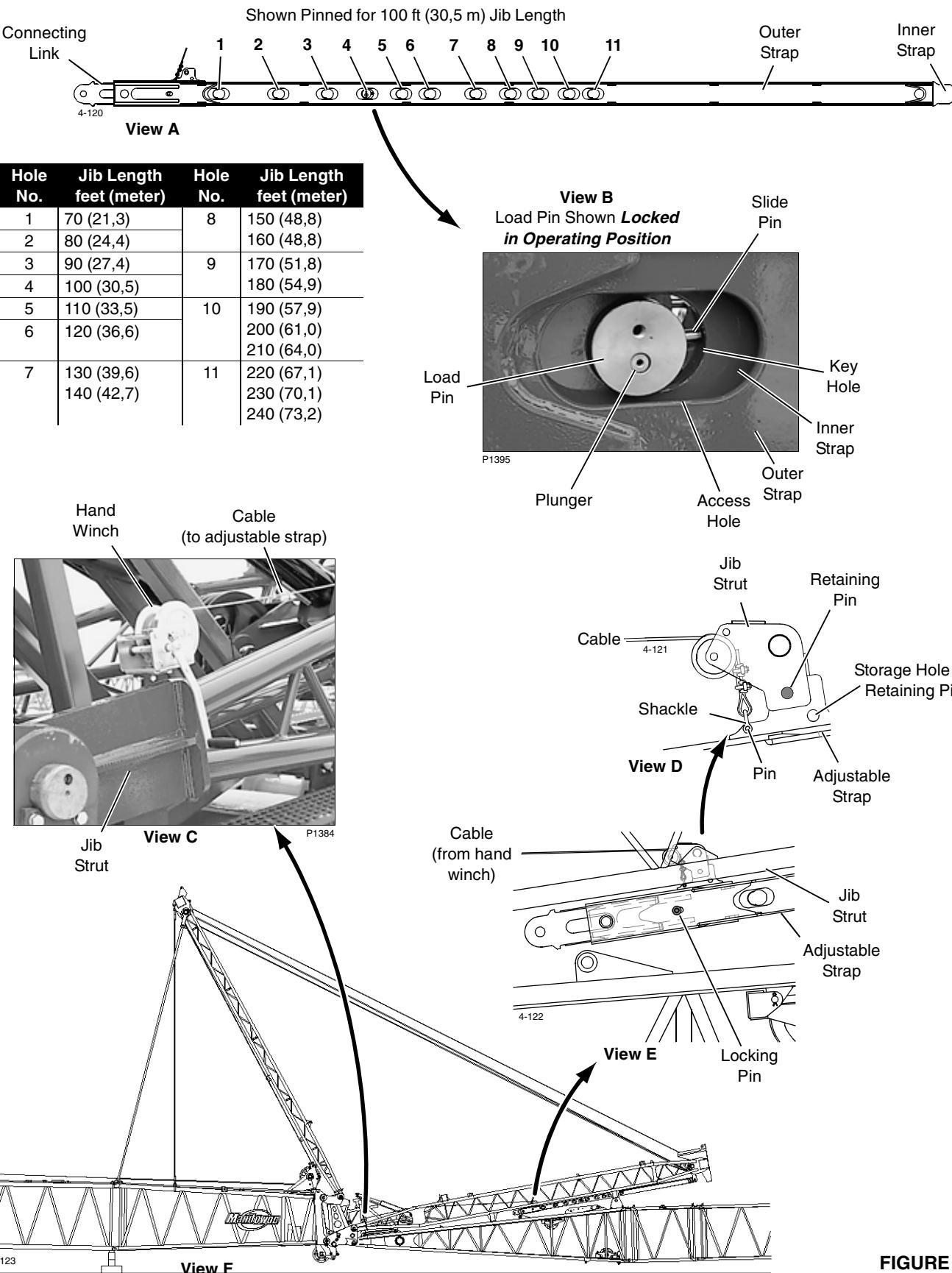


FIGURE 4-11

Set Up Adjustable Straps

See Figure 4-11 for following procedure.

The adjustable strap (View A) consists of four major parts: a connecting link, an inner strap, an outer strap, and a load pin.

The connecting link is pinned to the backstay strap on the strut. The inner strap is retained inside the outer strap. The outer strap slides up or down over the inner strap. The load pin must be installed in the proper key hole in the inner strap before the jib strut is raised. The length of the jib dictates which key hole must be used.

The outer rims of the load pin have flanges that hold the pin in place in the key hole in the inner strap (View B). A slide pin mounted inside the load pin holds the load pin in place. Depressing a spring-loaded plunger in the load pin allows the slide pin to move through the load pin as long as the plunger is depressed. When released, the plunger engages one of two grooves in the slide pin to lock the slide pin in place. Extending the slide pin holds the load pin in place in the key hole.



DANGER

Crane Collapse!

Install and lock load pins in proper holes of adjustable straps for jib length in use (Figure 4-11, View A)



WARNING

Adjustable Strap Separation!

Make sure adjustable strap locking pin is installed (Figure 4-11, View E) before raising jib strut.

Perform following steps at both adjustable straps.

1. Determine correct pinning location for adjustable strap based on jib length. (See View A and table in Figure 4-11).
2. Remove load pin from its stored position in adjustable strap by depressing plunger and sliding load pin toward wider end of key hole (View B).
3. Remove pin through access hole in outer strap.
4. Insert pin through access hole in outer strap at required pinning location.
5. Depress plunger and slide load pin into narrow end of key hole. Release plunger.
6. Check that load pin is tightly locked against narrow end of key hole (View B).

NOTE: If load pin is not tightly locked in operating position, remove load pin, rotate it 180°, and reinstall.

7. Make sure locking pin is installed as shown in View E.
8. Check that cable from hand winch is attached to adjustable strap (View D).
9. Check that cable between hand winch and adjustable strap is snug.
10. Check that ratchets on hand winches are set to prevent winches from paying out line.
11. Remove retaining pin connecting adjustable strap to jib strut. Install retaining pin in storage hole (View D).

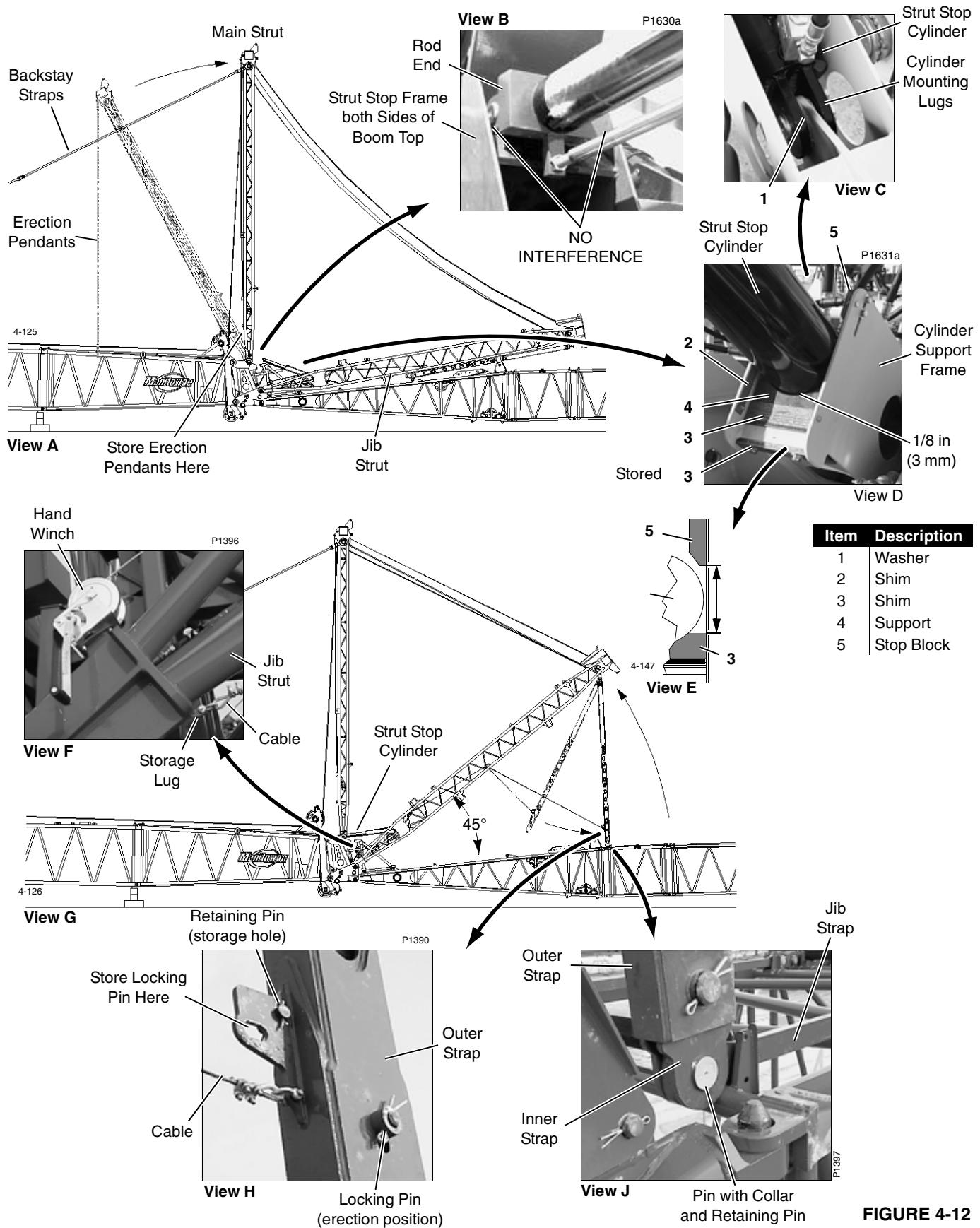


FIGURE 4-12

Raise Jib Strut

See Figure 4-12 for following procedure, unless otherwise noted.

**WARNING****Moving Part Hazard!**

Do not stand on boom top or jib butt while either strut is being raised or lowered.

Wait until struts are stopped and supported by an assist crane or luffing hoist wire rope before climbing onto boom top or jib butt.

NOTE: While raising strut, use mechanical angle indicator mounted on jib strut to monitor strut angle.

1. Haul in luffing hoist wire rope until main strut is near vertical and jib strut just starts to rise (View A).
2. Attach both erection pendants to storage bar on main strut with shackles on ends of pendants (Figure 4-9, View A).
3. Continue hauling in luffing hoist wire rope to slowly raise jib strut to approximately 45° and stop (View G).
4. While raising jib strut, observe strut stop cylinder rod ends. Following adjustments were made at factory and should not require field adjustment.

- a. Make sure rod ends do not interfere with any part of strut stop frames (View B).

If interference occurs, readjust washers (1, View C) and shims (2, View D) until there is NO INTERFERENCE (cylinders centered in frames).

- b. Install shims (3, View D) under supports (4) so that when rollers bottom out in strut stop pockets on boom top (Figure 4-13, View B) gap is 1/8 in (3 mm) between supports (4) and underside of cylinders.

- c. Reposition stop blocks (5, View E) so distance between stop blocks and supports (4) is 5 in (127 mm).

CAUTION**Structural Damage!**

Do not raise jib strut above 70° during erection while boom is on ground. Structural damage to jib strut or strut stop cylinders will occur. At 70° strut angle, cylinder rods will have approximately 5 in (127 mm) travel remaining (Figure 4-13, View B).

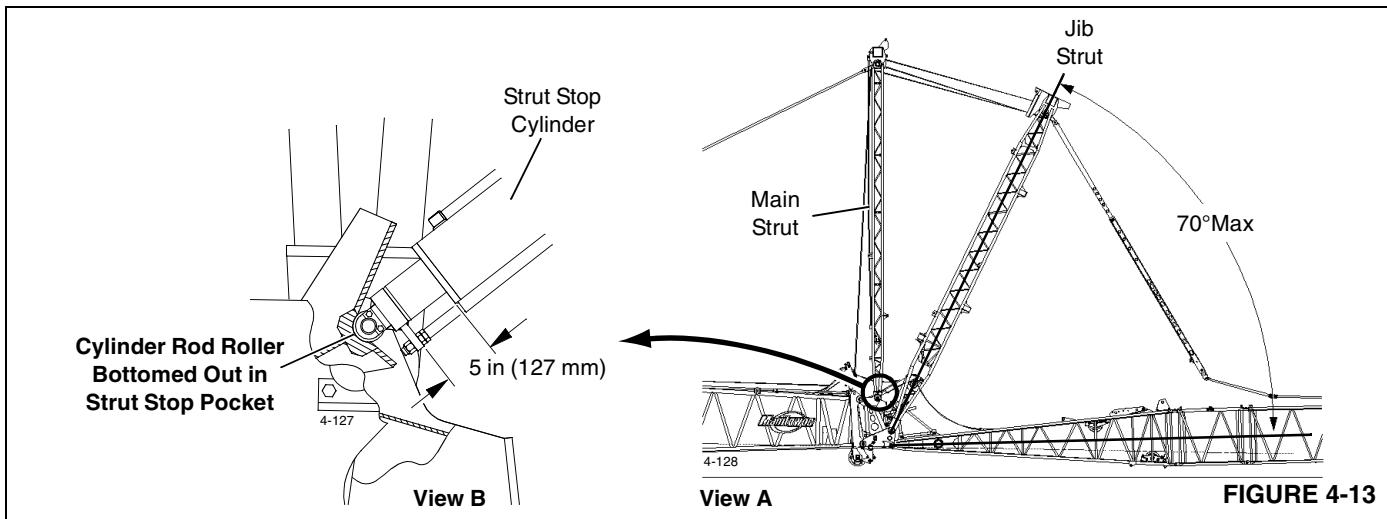
5. Connect adjustable straps to jib straps on jib insert:
 - a. Using hand winch, lower adjustable straps to vertical (View G). Raise or lower strut as needed.
 - b. Raise or lower strut as needed to align connecting holes in inner straps with connecting holes in jib straps on jib insert.
 - c. Pin adjustable straps to jib straps (View J).
6. With jib straps resting in supports on insert, raise or lower jib strut so there is **no load on locking pin in each adjustable strap**.
7. Remove locking pins (View H) and store in holes in outer straps.

CAUTION**Structural Damage!**

Inner straps will not extend to proper length if locking pins are not removed. Structural damage will occur.

8. Disconnect cables from outer straps (View H) and connect cables to storage lugs at base of jib strut (View F).

Use hand winch to tighten cable as needed.



Install Load Lines

Depending on your lifting requirements, the luffing jib can be operated with load lines over either jib point, lower or upper.

1. See Capacity Chart for lifting limitations and required deducts when handling loads from selected locations.
2. See Wire Rope Specifications Chart in Luffing Jib Capacity Chart Manual to determine parts of line required for your job. Size load block accordingly.
3. Route load line from desired drum through proper guide sheaves on boom (See Load Line Reeving in this section).
4. If jib will be raised using In-Line Method, install load block and weight ball from jib points before boom and jib are raised.
5. If jib will be raised using Jack-Knife Method, proceed as follows:
 - a. Reeve load lines through guide sheaves in jib point.
 - b. Pull load lines approximately 20 ft (6,1 m) past end of jib and lay lines on ground.
 - c. Securely tie off load lines to jib point. Install load block and weight ball after boom and jib are jack-knifed into position just prior to raising jib point rollers off ground.



WARNING

Run-Away Wire Rope!

For long boom and short jib combinations, wire rope on boom side of attachment can overhaul unsecured wire rope on jib side. This could cause personnel injuries and damage to equipment. Securely tie off load lines to jib before raising attachment.

Connect Electric Cords

Connect electric cords to respective junction boxes and switches. See Boom Wiring and Limits Diagram at end of this section:

- Jib stop limit switches on jib adapter.
- Block-up limit switches.
- Load sensors (for attachments without wireless RCL).

Install Wind Speed Indicator Assembly

Install wind speed indicator if removed for shipping. Use star washers to attach mounting bracket to jib top to provide good a ground (see Wind Speed Assembly drawing at end of this section).

Connect electrical cable at base of wind speed mounting bracket.

Adjust Electronic Devices

Adjust electronic devices according to instructions in Section 6 of this manual:

- Jib stop limit switches.
- Boom stop limit switch (to 85° or 87°, depending on boom length, after boom and jib are raised).
- Block-up limit switches.

Pre-Raising Checks

Make the following checks and correct any defects before raising the attachment.

- Lower boom point removed from boom top if required by raising procedure chart.
- Rigging winch and wire rope guides removed from jib butt if required by raising procedure chart.

- Crawlers blocked if required by raising procedure chart. See Crawler Blocking Diagram for blocking procedure.
- All installation steps given in this section performed.
- Boom and jib inserts installed in proper sequence according to rigging drawings.
- Upper jib point roller installed.
- Boom, jib, and backstay straps installed in proper sequence according to rigging drawings.
- Adjustable jib straps locked in proper position.
- All connecting pins installed and properly secured.
- Main and jib struts in operating position.
- All hydraulic connections made.
- Jib stop in operating position.
- Jib strut stop cylinders extended and adjusted.
- Boom and luffing hoist wire rope anchored properly to drums, spooled tightly onto drums, and engaged with proper sheaves (see Rigging Drawings and Wire Rope Installation and Maintenance in this section).
- Load lines anchored properly to drums, spooled tightly onto drums, and engaged with proper sheaves (see Reeling Diagrams and Wire Rope Installation and Maintenance in this section).
- Wire rope guard pins, bars, or rollers installed to retain wire rope in sheaves.
- If load line will be installed after boom and jib are jack-knifed into position, make sure load line going to jib point is securely attached to end of jib point so load line cannot fall off jib and boom.**
- All blocking, tools, and other items removed from boom and jib.
- All blocking, tools, and other items removed from jib point roller path area.

- All safety devices installed, electric cords connected, and limits adjusted (see appropriate adjustments sections in this manual):
 - Rated Capacity Indicator/Limiter.
 - Boom and jib angle indicators.
 - Automatic boom stop (must be reset for luffing jib operation after boom and jib are raised).
 - Automatic jib stops.
 - Jib and boom block-up limits.
- Luffing Jib Raising Procedure Chart reviewed, and following operations determined:
 - Raising method — in-line or jack-knife.
 - Required boom to jib angle for jack-knife raising method.
- Raising procedure in this section read and thoroughly understood.
- Proper amount of crane counterweight installed.
- Wind within allowable limits for raising boom and jib (see charts in Luffing Jib Operator's Manual).
- All lube points greased (see Lubrication Guide in Luffing Jib Operator's Manual).
- LUFFING JIB mode selected and confirmed.

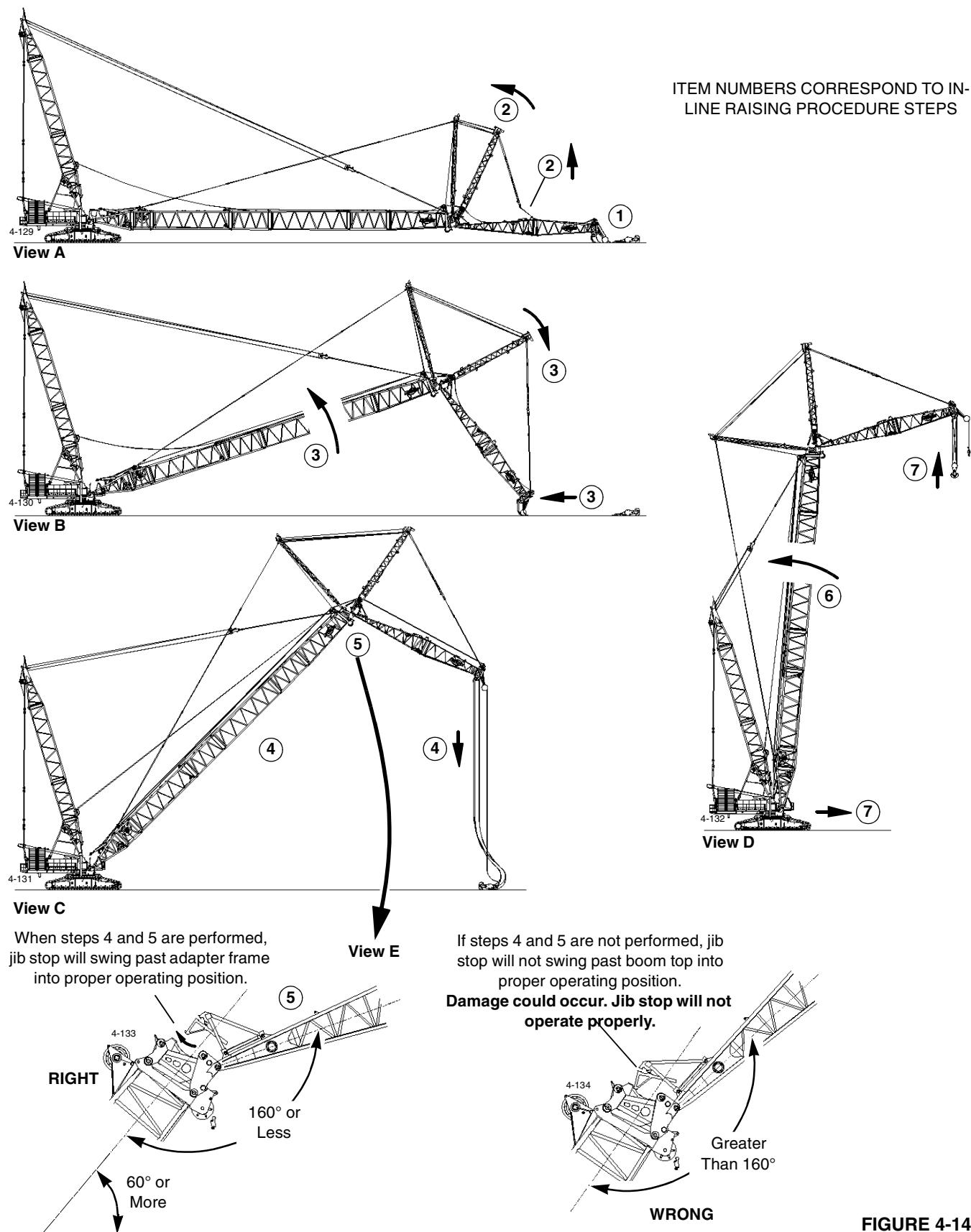


FIGURE 4-14



Raising Boom and #44 Luffing Jib

General



WARNING

Falling Boom And Jib Hazard!

Select and confirm LUFTING JIB mode. Operating in any other mode with luffing jib attached is prohibited.

Luffing jib limits are disabled when LUFTING JIB mode is off. Boom and jib could be pulled over backwards.



WARNING

Moving Part Hazard!

Warn all personnel to stand clear of jib point rollers while raising boom and jib.

Use digital display in operator's cab to monitor boom angle and boom to luffing jib angle while raising boom and jib.

In-Line Raising Procedure

See Figure 4-14 for following procedure.

NOTE: It is normal for the following limits to come on during the raising procedure:

BLOCK UP – this fault will go off once the boom and luffing jib are raised and the load lines/block-up limit chains are hanging freely.

MAX UP 1 and MAX UP 2 – these faults will go off once the boom to luffing jib angle is less than 168°.



WARNING

Tipping Crane Hazard!

When using in-line method:

- Do not raise boom and jib combinations longer than specified on raising procedure chart.
- Raise boom to desired operating angle and position jib at required operating radius before lifting load block and/or weight ball from ground.

1. Install load block and/or weight ball (if not already done).
2. Slowly luff up to raise jib strut until jib straps clear strap storage brackets on jib and stop.

It will be necessary to use limit bypass switch to luff up if MAX UP 1 limit is on.

CAUTION

Structural Damage!

Do not exceed 70° jib strut angle while boom is on ground. Use mechanical angle indicator on jib strut to monitor strut angle.

3. Slowly boom up to raise boom until jib straps are taut and stop. Jib point rollers will roll along ground as boom and jib rise.

Pay out load lines as boom is raised.

CAUTION

Jib Stop Damage!

Jib stop will not swing past boom top to operating position if steps 4 and 5 are not performed. Damage could occur. Jib stop will not operate properly.

4. Continue to slowly boom up to raise boom and jib until boom angle is 60° or higher and stop.

Pay out load lines as boom is raised.

5. Check boom to luffing jib angle. If angle is more than 160°, luff down until angle is 160° or less.

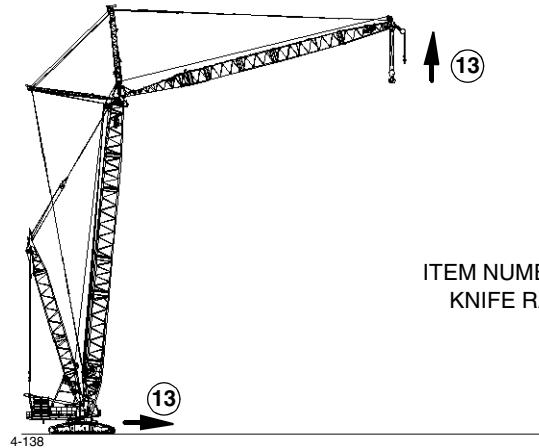
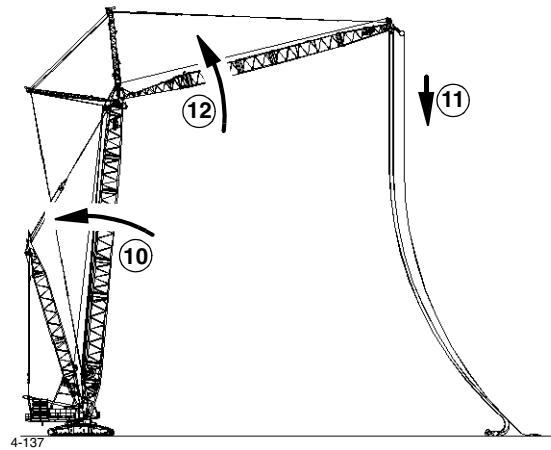
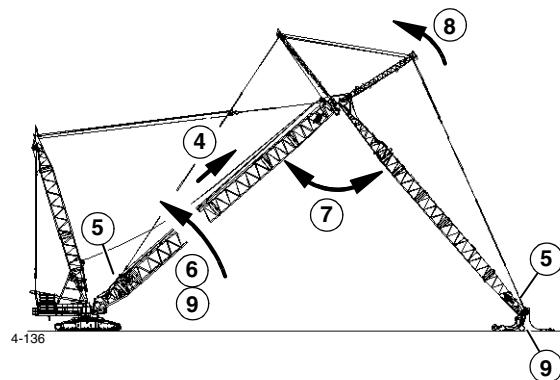
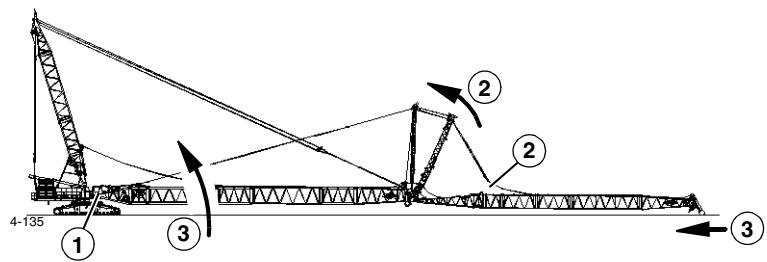
Jib stop will swing past boom top into operating position.

It will be necessary to use limit bypass switch to luff down if BLOCK UP limit is on.

6. Raise boom and jib to desired operating angle and radius.

Pay out load lines as boom and jib are raised.

7. Travel crane forward until jib point is over load block and/or weight ball and lift load block and/or weight ball to desired operating position.



ITEM NUMBERS CORRESPOND TO JACK-KNIFE RAISING PROCEDURE STEPS

FIGURE 4-15

Jack-Knife Raising Procedure

See Figure 4-15 for following procedure.

**WARNING****Tipping Hazard/Structural Damage!**

- See Raising Procedure Chart to determine BOOM TO LUFTING JIB ANGLE that boom and jib must be jack-knifed to before jib can be raised.
- Do not raise boom and jib combinations longer than specified on raising procedure chart.
- Monitor angle on digital display as boom and jib are raised.

CAUTION**Structural Damage!**

- Do not exceed 70° jib strut angle while boom is on ground. Use mechanical angle indicator on jib strut to monitor strut angle.
- **Avoid side loading as boom and jib are raised.**
- Disengage swing lock and release swing brake until boom and jib have been raised to required boom to luffing jib angle.

NOTE: It is normal for the following limits to come on during the raising procedure:

BLOCK UP – this fault will go off once the boom and luffing jib are raised and the load lines/block-up limit chains are hanging freely.

MAX UP 1 and MAX UP 2 – these faults will go off once the boom to jib angle is less than 168°.

1. Disengage swing lock and release swing brake.
2. Slowly luff up until jib straps lift out of strap brackets on jib and stop.
3. Slowly boom up.

Jib point rollers will roll along ground as boom and jib are jack-knifed into position.

**WARNING****Tipping Hazard/Structural Damage!**

Do not allow jib or backstay straps to become too tight during raising steps. Crane will tip or structural damage will result.

Do not allow jib and backstay straps to become too slack during raising steps. Jib strut could fall onto jib butt.

4. Pay out load lines as boom and jib are raised.

5. Jib straps and backstay straps will tighten as boom and jib rise.

OPERATOR AND SIGNAL PERSON — watch backstay straps and jib straps along left side of boom and jib as boom and jib rise.

Pay out luffing hoist wire rope (luff down) so jib straps remain slack.

- Allow backstay straps to float up and down 3 - 6 in (76 - 162 mm) above strap brackets at top end of boom butt.
 - Allow jib straps to float up and down 3 - 6 in (76 - 162 mm) above strap brackets at end of jib top.
- It will be necessary to use limit bypass switch to luff down if BLOCK UP limit is on.
6. Slowly continue with Jack-Knife Raising Procedure steps 3 - 5.

**WARNING****Falling Jib Hazard/Structural Damage!**

Do not lower jib to any boom or jib angle less than minimum stop (70°).

7. Stop raising boom when boom and jib have been positioned at required boom to luffing jib angle or jib is vertical, whichever occurs first. **Monitor this angle on digital display.**
8. Slowly luff up until jib straps start to go into tension and stop.
9. Boom up to raise jib point rollers clear of ground, apply swing brake, and install load block and/or weight ball (see Install Load Lines in this section). Untie load lines from jib after installing load block and/or weight ball.

**WARNING****Falling Load Hazard!**

Raise boom to desired operating angle and position jib at required operating radius before lifting load block and/or weight ball from ground.

10. Slowly raise boom to desired operating angle. See Capacity Chart for allowable boom angles.
11. Pay out load lines as boom and jib are raised.
12. Luff up to position jib at required operating radius for load to be handled.
13. Travel forward as required to position load block and/or weight ball below jib points and lift load block and/or weight ball to desired operating position.

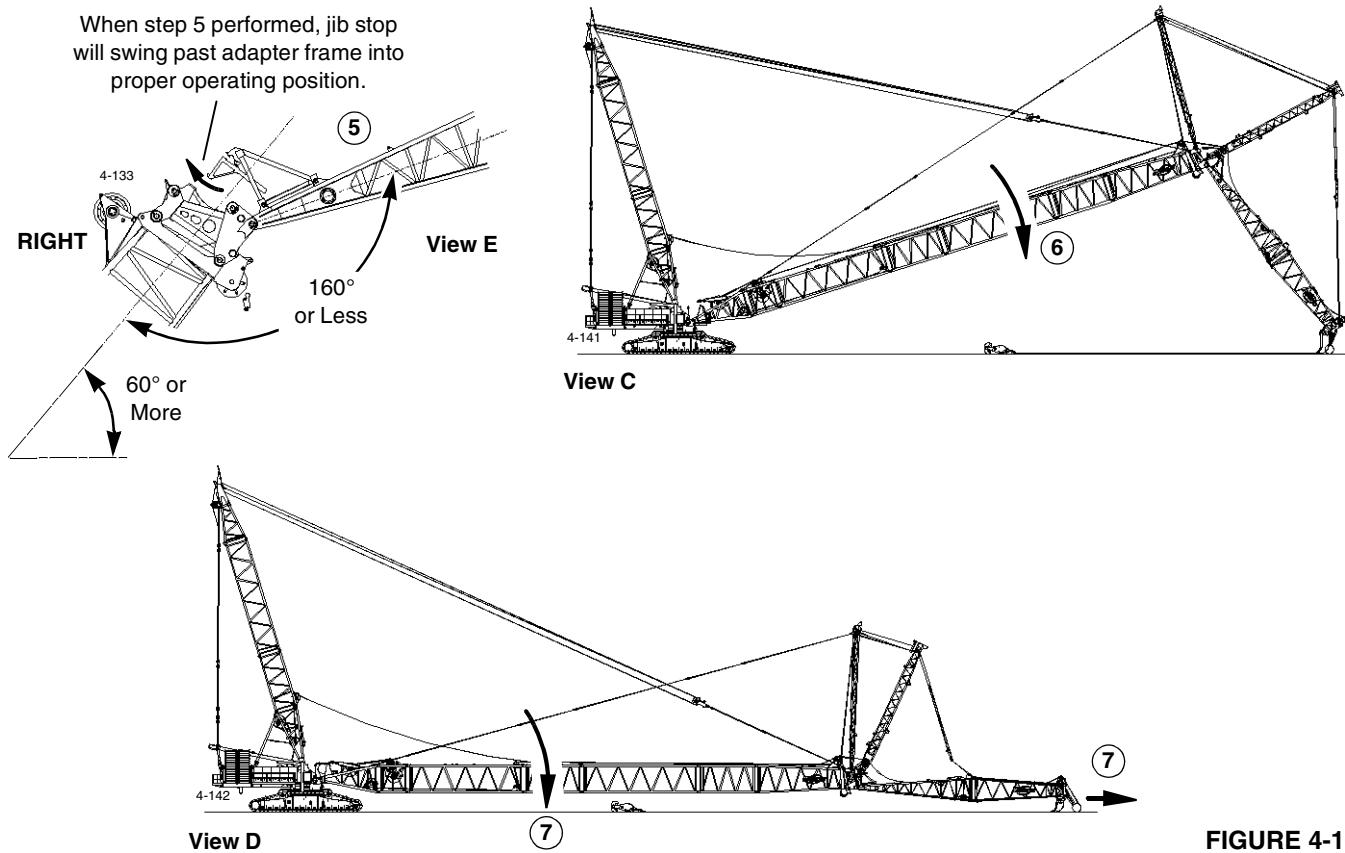
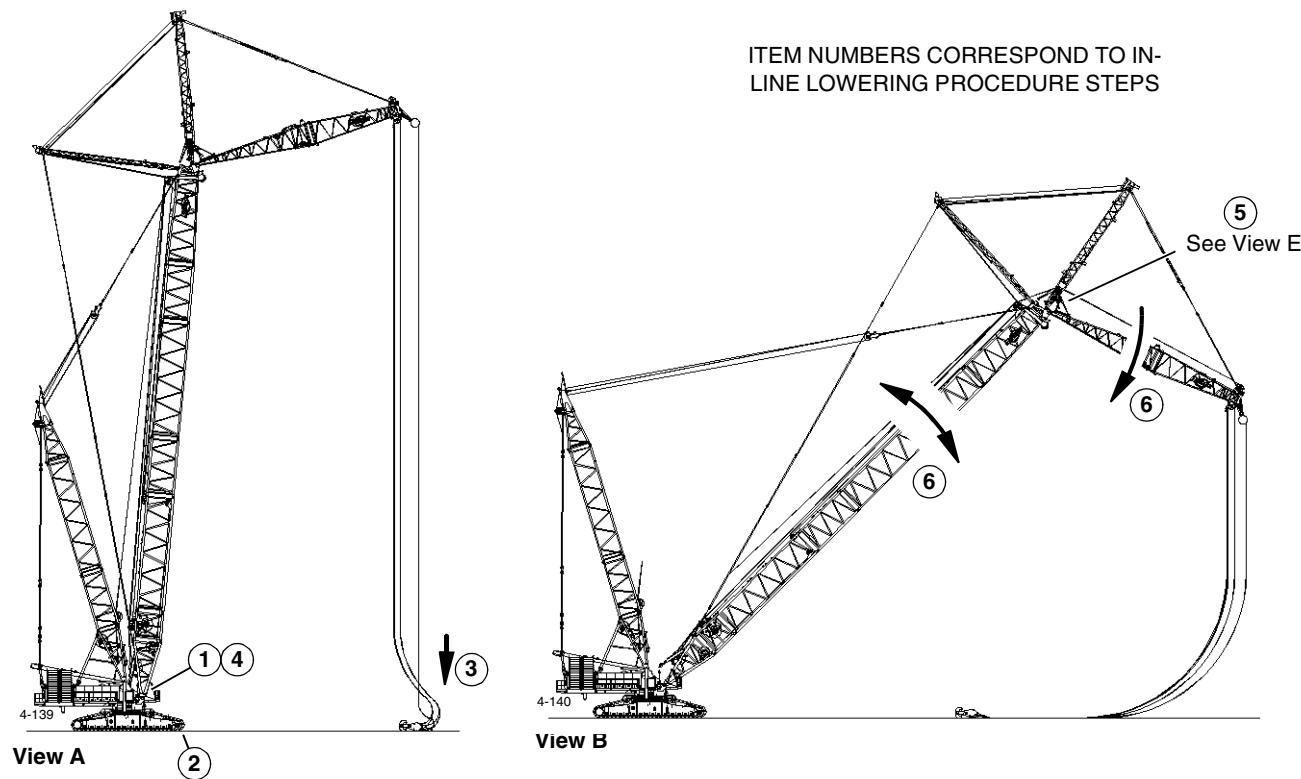


FIGURE 4-16

Lowering Boom and #44 Luffing Jib

General



WARNING

Falling Boom And Jib Hazard!

Select and confirm LUFTING JIB mode. Operating in any other mode with luffing jib attached is prohibited.

Luffing jib limits are disabled when LUFTING JIB mode is off. Boom and jib could be pulled over backwards.



WARNING

Moving Part Hazard!

Warn all personnel to stand clear of jib point rollers while lowering boom and jib.

As defined in the raising procedure chart, one of two methods can be used to lower the boom and jib depending on the boom and jib combination: In-Line Method or Jack-Knife Method. See the chart to determine which method can be used. **Be sure crane is properly configured for selected method.**

NOTE: Use digital display in cab to monitor boom and boom to luffing jib angles while lowering boom and jib.

In-Line Lowering Procedure

See Figure 4-16 for following procedure.



WARNING

Tipping Crane Hazard!

- Observe boom to luffing jib angles specified on raising procedure chart.
- If required by raising procedure chart, lower boom and jib over blocked crawlers.
- Lower load block and/or weight ball to ground before lowering boom and jib.

NOTE: It is normal for BLOCK UP, MAX UP 1, and MAX UP 2 limits to come on during the lowering procedure.

1. Swing upperworks in line with lowerworks so boom is over *front of crawlers*.
2. Travel crawler rollers onto blocking, if required.
3. Swing boom and jib slightly to either side of center and lower load block and/or weight ball to ground.
4. Swing boom and jib in line with crawlers.

CAUTION

Jib Stop Damage!

Jib stop will not rotate to proper storage position if step 5 is not performed.

5. Position boom at 60° or higher boom angle and lower luffing jib to 160° or less boom to luffing jib angle (View E).
6. Slowly boom down until jib point rollers contact ground. It will be necessary to use limit bypass switch to boom down if BLOCK UP limit is on.
Haul in load lines as boom and jib are lowered but *do not lift load block and/or weight ball off ground*.

CAUTION

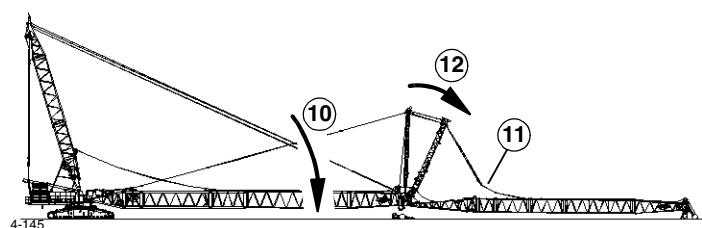
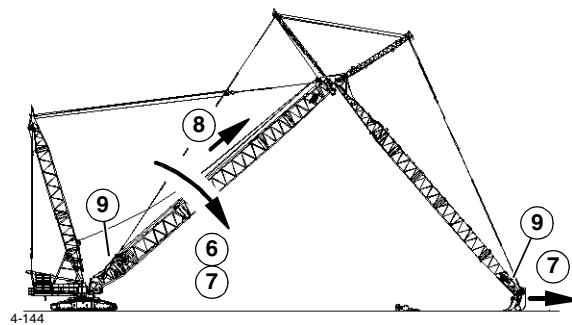
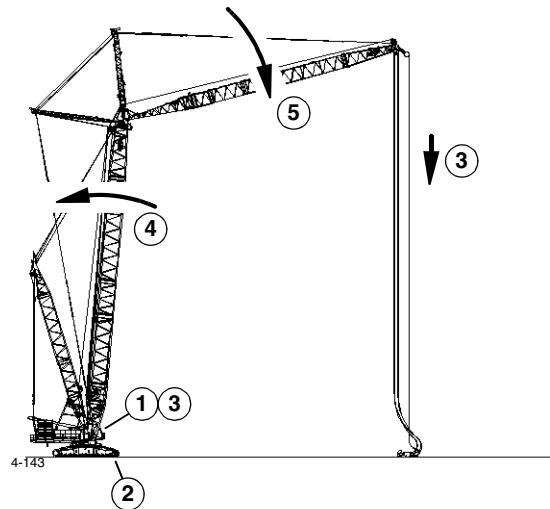
Structural Damage!

Do not exceed 70° jib strut angle while boom is on ground. Use mechanical angle indicator on jib strut to monitor strut angle.

7. Perform Jack-Knife Lowering Procedure steps 7–12 to lower boom and jib remaining distance.

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ITEM NUMBERS CORRESPOND TO JACK-KNIFE LOWERING PROCEDURE STEPS



4

FIGURE 4-17

Jack-Knife Lowering Procedure

See Figure 4-17 for following procedure.

**WARNING****Tipping Crane Hazard!**

- Observe boom to luffing jib angles specified on raising procedure chart. Use digital display in cab to monitor boom and boom to luffing jib angles.
- If required by raising procedure chart, lower boom and jib over blocked crawlers.
- Lower all load block and/or weight ball to ground before lowering boom and jib.

**WARNING****Moving Part Hazard!**

Warn all personnel to stand clear of jib point rollers while lowering boom and jib.

NOTE: It is normal for the BLOCK UP, MAX UP 1, and MAX UP 2 limits to come on during the lowering procedure.

1. Swing upperworks in line with lowerworks so boom is centered over *front of crawlers*.
2. Travel crawler rollers onto blocking, if required.
3. Swing boom and jib slightly to either side of center and lower load blocks and/or weight balls onto ground. Then swing boom and jib in line with crawlers and apply swing brake.

**WARNING****Tipping Crane Hazard!**

Do not lower boom and jib to ground until boom has been positioned at minimum boom angle of 70° and jib has been positioned at specified boom to luffing jib angle. Use digital display in cab to monitor boom and boom to luffing jib angles.

**WARNING****Falling Jib Hazard!**

Do not lower jib to any boom to luffing jib angle less than minimum stop (70°). Structural damage to jib butt will occur, possibly causing jib to collapse.

Monitor angle on digital display.

It will be necessary to use limit bypass switch to luff down if BLOCK UP limit is on.

CAUTION**Structural Damage!**

- **Avoid side loading as boom and jib are lowered.**
- Disengage swing lock and release swing brake when jib point rollers contact ground.

6. Slowly boom down until jib point rollers contact ground.

Depending on boom and jib combination, jib may be hanging vertical when rollers contact ground. If this happens, raise jib (luff up) until jib is a few degrees forward of vertical.

It will be necessary to use limit bypass switch to boom down if BLOCK UP limit is on.

7. Release swing brake (disengage swing lock) and continue to lower boom slowly.

Jib point rollers will roll along ground as boom and jib unfold.

8. Pay out load lines as boom and jib lower.

9. Jib straps and backstay straps will slacken as boom and jib lower.

OPERATOR AND SIGNAL PERSON — watch backstay straps and jib straps along left side of boom jib as boom and jib lower.

Do not allow straps to become to slack.

- Allow backstay straps to float up and down 3–6 in (76–162 mm) above strap brackets at top end of boom butt.

- Allow jib straps to float up and down 3–6 in (76–162 mm) above strap brackets at end of jib top.

It will be necessary to use limit bypass switch to luff down if BLOCK UP limit is on.

WARNING**Tipping Hazard/Structural Damage!**

Do not allow jib or backstay straps to become too tight during lowering steps. Crane will tip or structural damage will result.

Do not allow jib and backstay straps to become too slack during lowering steps. Jib strut could fall onto jib butt.

10. Continue with Jack-Knife Lowering Procedure steps 7–9 until boom top is resting on blocking at ground level.

11. Slowly luff down to lower jib strut until jib straps rest in strap storage brackets on jib.

12. Lower struts as described in Removing Jib later in this section.

Removing #44 Luffing Jib

Lowering Jib Strut



WARNING

Moving Part Hazard!

Do not stand on boom top or jib butt while either strut is being lowered.

Wait until struts have been stopped and are supported by load line or luffing hoist line before climbing onto boom top or jib butt during disassembly.

1. Pay out luffing jib hoist line (Drum 6) to lower jib strut. Continue lowering strut until jib straps are resting in strap brackets and adjustable straps are fully retracted (Figure 4-10, View G). Strut will be at approximately 45°.
2. Remove locking pins from storage holes and install in adjustable straps (Figure 4-10, View H). Luff up or down to align holes in straps.
3. Disconnect inner straps from jib straps. (Figure 4-10, View J). Luff up or down to loosen pins.
Store pins in inner straps.
4. Store adjustable straps:
 - a. Release ratchet on hand winch (Figure 4-10, View F).
 - b. Disconnect cable from storage lug on jib strut (Figure 4-10, View F).
 - c. Attach cable to lug on adjustable strap (Figure 4-10, View H).
 - d. Remove retaining pin from storage hole in outer strap (Figure 4-10, View H).
 - e. Using hand winch, raise adjustable strap to storage position (Figure 4-9, View E).
 - f. Install retaining pin to secure adjustable strap to jib strut (Figure 4-9, View D).
 - g. Repeat preceding steps 4a – 4f for other adjustable strap.
5. Lower jib strut onto strut supports (Figure 4-9, View F).
6. Continue to luff down until main strut comes to rest on boom top wire rope guide (Figure 4-9, View F).
7. Disconnect hydraulic hoses from jib strut at boom top (Figure 4-8, View E). **Install dust caps.**
Coil hoses and tie them to jib strut for storage.

8. If boom will be removed, disconnect hydraulic hoses between boom inserts (Figure 4-8, View D). **Install dust caps.**

Lowering Main Strut

1. Disconnect both erection pendants from storage bar on main strut (Figure 4-7, View A).
2. Connect one erection pendant to load line from (Drum 1) (Figure 4-7, View C).
3. Connect other erection pendant to sling from assist crane.
Haul in assist crane load line until erection pendant is hanging vertically above main struts. Keep pendant slack.
4. Disconnect basic backstay straps from backstay straps on boom (Figure 4-7, View F).
5. Pin links in storage position on boom (Figure 4-14, View B).
6. Attach taglines to end of basic backstay straps. Taglines should be about 20 ft (6,1 m) long.
7. Slowly haul in luffing hoist wire rope while paying out load line from Drum 1 to pull main strut forward.
 - Match rate of speed that luffing hoist wire rope is hauled in with speed that load line from Drum 1 is payed out so strut moves smoothly past vertical without falling.
 - Once strut is past vertical, keep luffing hoist wire rope slack while paying out load line.
 - Guide basic backstay straps into storage brackets on side of strut with taglines.
8. Lower main strut to approximately 45° and stop (Figure 4-7, View D).
9. Haul in assist crane load line until assist crane is supporting strut.
10. Lower strut with assist crane while keeping luffing hoist wire rope and load line from Drum 1 slack.
11. Stop lowering main strut when it comes to rest on jib strut.
12. Remove taglines.
13. Disconnect erection pendants from assist crane and Drum 1 load line.
Connect pendants to storage bar on main strut for storage.
14. Install strap storage pins in shipping holes to secure straps to sides of main strut (Figure 4-7, View B).

Remove Struts

See Figure 4-13 for following procedure.

1. Remove main strut, as follows:
 - a. Connect chain slings from assist crane to four lifting lugs on main strut (View D).
Rear slings should be 6 - 8 ft (1,8 - 2,4 m) longer than front slings.
 - b. Attach taglines to strut so that swing motion can be controlled when hinge pins are removed.
 - c. Remove keeper plate from both sides of adapter frame (View C).
 - d. Lift main strut so slings are taut and hinge pins are loose.
 - e. Remove hinge pins.
 - f. Lift main strut away from adapter frame and jib strut, and place main strut on blocking at ground level.
 - g. Disconnect slings from main strut.
 - h. Reinstall hinge pins and keeper plates in adapter frame for storage.

2. Remove jib strut, as follows:
 - a. Connect chain slings from assist crane to four lifting lugs on jib strut (View B).
Rear slings should be 6 - 8 ft (1,8 - 2,4 m) longer than front slings.
 - b. Attach taglines to strut so that swing motion can be controlled when hinge pins are removed.
 - c. Remove keeper plate from both sides of adapter frame (View A).
 - d. Lift jib strut so slings are taut and hinge pins are loose.
 - e. Remove hinge pins.
 - f. Lift jib strut away from adapter frame and place jib strut on ground.
 - g. Disconnect slings from jib strut.
 - h. Reinstall hinge pins and keeper plates in adapter frame for storage.

See Figure 4-14 for following procedure.

3. The main strut, jib strut, and adjustable straps can be shipped as an assembled unit to reduce shipping space. To assemble struts for shipping, proceed as follows:

- a. Connect chain slings from assist crane to four lifting lugs on main strut. Lift strut so it is level.
- b. Lift main strut into position over jib strut.
- c. Swing, boom, and hoist assist crane as required to engage latch on main strut with hook on jib strut (View D).
Use care not to hit strut stop cylinders with main strut.
- d. Remove retaining pins from jib strut holes (View E).
- e. Align holes in end of main strut with holes in end of jib strut and install retaining pins (View E).
- f. Lift strut assembly onto transport trailer and disconnect slings.

Removing Jib Attachment



WARNING

Collapsing Boom/Jib Hazard!

Improper disassembly of boom and jib sections can cause boom or jib to collapse onto personnel removing connecting pins.

Death or serious injury can result if precautions listed below are not taken:

- Lower boom/jib so boom and jib points are supported on blocking or ground.
- Slacken rigging — do not attempt to remove connecting pins while boom or jib is supported by rigging.
- Block below both ends of each boom or jib section before removing connecting pins.
- Stand on outside of boom or jib sections when removing connecting pins. Never work under or inside boom or jib sections. Use care not to damage lacings and chords as pins are knocked out.

Remove jib in opposite sequence of installing jib.

Automatic boom stop must be reset to 85° for MAX-ER operation without jib.

LUFFING JIB RIGGING GUIDE – #79A

General

The following installation, raising, lowering, and removal instructions apply to the #79A luffing jib mounted on a #55 or #55A boom.

As shown on the Luffing Jib Assembly drawing, 20 ft (6,1 m) and 40 ft (12,2 m) inserts from a #79 boom can be used to make up the desired jib length. However, the jib has a different 20 ft (6,1 m) butt with a special 20 ft (6,1 m) insert, and a different top.

Assist Crane Requirements

An assist crane is required for jib installation and removal.

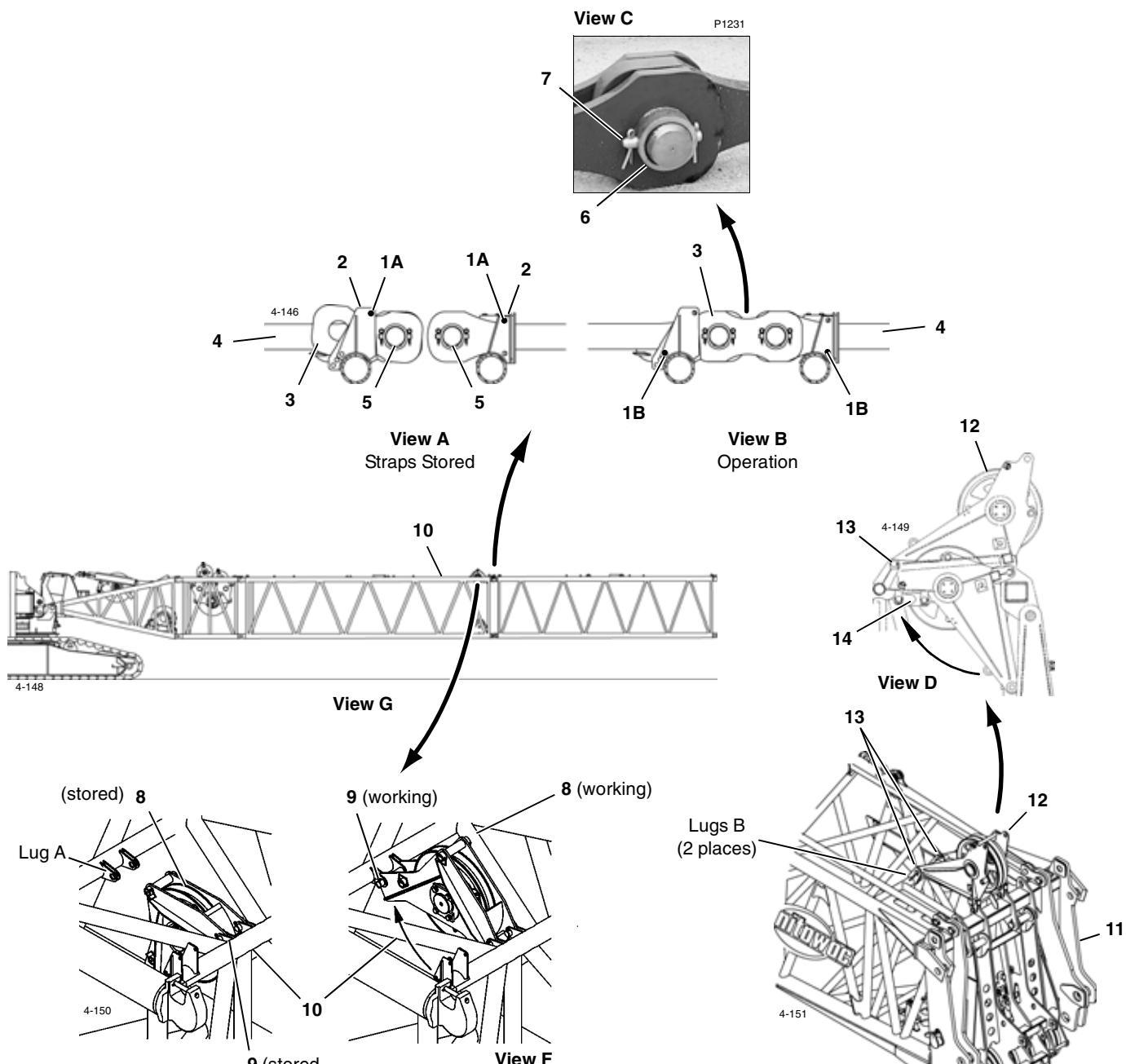
The heaviest individual parts to be lifted are the strut tops which are shipped assembled together. This assembly weighs approximately 18,500 lb (8 392 kg).

The assist crane must also be capable of handling the following weights:

- Main Strut — 50,000 lb (22 680 kg) during strut raising and lowering. The assist crane must have a hook height of 110 ft (33,5 m) minimum.
- Jib — maximum of 100,000 lb (45 360 kg) when lifting jib point onto the dolly. This is 1/2 the weight of the maximum jib length.



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Item	Description	Item	Description
1A	Storage Pin (strap stored)	9	Pin with Snap Pin
1B	Storage Pin (operation)	10	40 ft (12,2 m) #55 Insert with Drum 6 Sheaves
2	Strap Bracket (typical)	11	#55 Boom Top
3	Link (typical)	12	Wire Rope Guide
4	Strap (typical)	13	Connecting Pin with Snap Pins
5	Connecting Pin (typical)	14	Link with Pins and Snap Pins (stored)
6	Collar (typical)	15	Counterweight Box
7	Retaining Pin (with cotter pins)	16	Lug
8	Drum 6 Wire Rope Guide		

FIGURE 4-18

Preparing Crane, Boom, and Mast

See Figure 4-18 for following procedure.

1. Lower boom to ground level onto blocking approximately 4 ft (1,2 m) high.
2. Remove load block.
3. If installed, remove load block and upper boom point.
4. Boom point sheave assembly can be installed on boom point.
5. Connect unused block-up limit electric cords to terminating plugs on boom point junction boxes.
6. If necessary, remove 40 ft (12,2 m) insert and install 40 ft (12,2 m) insert with Drum 6 sheaves (10, View F).
7. Raise luffing hoist wire rope guide (8, View F) on boom insert (10):
 - a. Remove stored pin (9).
 - b. Rotate wire rope guide with assist crane as shown.
 - c. Using pin (9), pin wire rope guide to Lug A.
8. Raise boom top wire guide:
 - a. Support wire rope guide (12, View D) with sling from assist crane.
 - b. Remove connecting pins (13, View D).
 - c. Rotate wire rope guide to working position (View E).
 - d. Pin wire rope guide to Lugs B (View E) with pins (13).

e. Do not install links and pins (14, View D) for luffing jib configuration.

9. Make sure removable strap brackets for luffing jib (18, Figure 4-21, View J) are installed on main strut butt.
10. If necessary, add lugs (16) for counterweight tie links to top crane counterweight boxes (15), one on each side, as shown in Figure 4-18, View H.

Install Backstay Straps on Boom

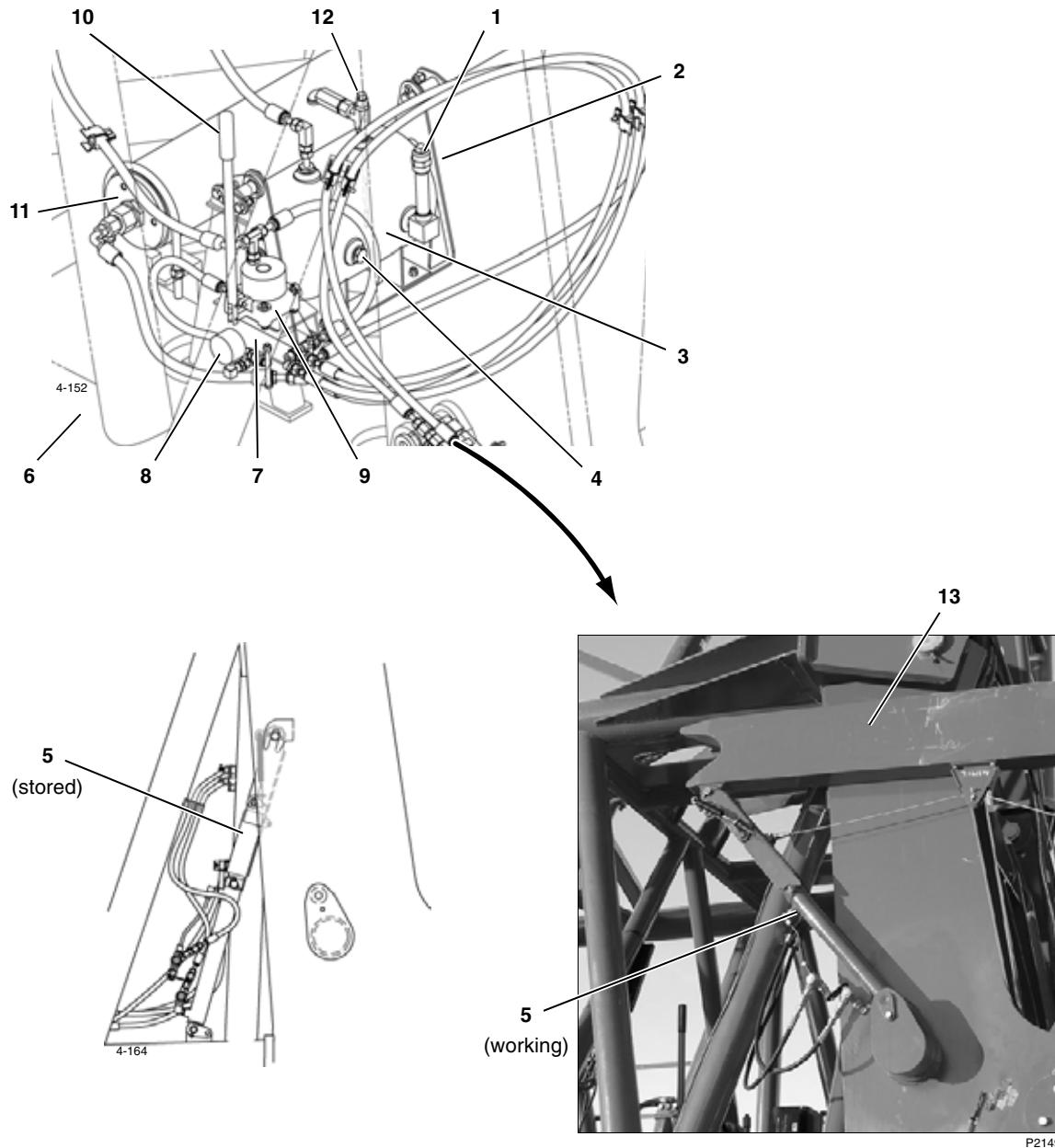
See Figure 4-18 for following procedure.

Starting at butt end of boom, install backstay straps in proper sequence on boom sections according to Luffing Jib Rigging Drawing. *This step is required only if straps are not stored on boom sections.*

To prevent interference between pins, heads of boom strap pins must face outboard sides of boom; heads of backstay strap pins must face inboard as shown in View C.

If the straps are already installed, proceed as follows:

1. Remove storage pins from top hole (1A, View A) in brackets (2).
2. Store pins in bottom holes (1B, View B) in brackets (2).
3. Rotate links (3) forward and pin to adjacent straps (4, View B).
4. Retain connecting pins (5, View B) with collars (6, View C) and retaining pins (7).



Item	Description	Item	Description
1	Fill Plug	7	Manifold Valve
2	Support Frame	8	Pressure Gauge
3	Reservoir, 4.7 gal (17,8 L)	9	Pump, Manual
4	Drain Plug	10	Pump Handle
5	Jib Stop Positioner	11	Accumulator, 5 gal (18,9 L)
6	Boom Top	12	Dipstick
		13	Jib Stop

FIGURE 4-19

Jib Stop Positioner Hydraulic System Operation**CAUTION****Structural Damage!**

Read and adhere to these instructions to prevent structural damage to components.

Positioner cylinders are extended and retracted using crane mode switch in operator's cab. Read Section 3 in this manual and Section 3 in the crane Operator's Manual for mode selection instructions.

**WARNING****System Under Pressure!**

Do not disconnect any part of system until system is depressurized. Components may shift suddenly, causing bodily injury.

See Figure 4-19 for following procedure.

NOTE: This procedure requires two persons: one at the boom top and an operator in the cab.

Initial Setup

1. Cylinders begin retracted and connected to jib stops.
2. Verify that accumulator pressure corresponds to pressure in following table (depending on ambient temperature).

Ambient Temperature	Pressure
Interpolate as Required	
30°F (-1°C)	1600 psi (110 bar)
50°F (10°C)	1665 psi (115 bar)
70°F (21°C)	1730 psi (119 bar)
90°F (32°C)	1796 psi (124 bar)

3. Put 2-1/2 gallons (10 L) of MCC A03745 Arctic 15 pre-filtered hydraulic oil in reservoir. Leave fill cap off.
4. Prime pump by pressuring reservoir slightly with user-supplied air pressure.
5. Begin pumping hand pump. Bleed cylinder and accumulator lines. When fluid flows clear, close lines.
6. Continue pumping hand pump. Cylinders will extend.
7. When cylinders are fully extended, signal operator to retract cylinders with mode switch. Weight of jib stops will retract cylinders.
8. Repeat steps 6 and 7 for 3 cycles to expel all air from cylinders and lines.
9. Pump hand pump until cylinders are fully extended.
10. Adjust tank oil level to top mark on dipstick. Dipstick should rest on tank fitting for proper oil level check.

11. Pump until oil level is at low mark on dipstick. Gauge reading must be 2,450 – 2,500 psi (169 – 172 bar). Record pressure on inspection record.

12. Seal fill and dipstick ports with hydraulic sealant.

Procedure For Raising Boom And Jib

1. Pump hand pump until pressure gauge reads 2,500 psi (172 bar).
2. Disengage safety latch using hand winch in jib top.
3. Set spring tension adjustment: 8-3/4 in (222 mm) minimum to 9 in (229 mm) maximum (see Set Up Jib Stop Positioners topic in this manual).
4. Signal crane operator to retract cylinders with mode switch.
5. Release tension on safety latch cable allowing enough slack for engagement when cylinders are extended. **Slack must be at safety latch.**
6. Raise boom to where boom to jib angle is 140°.
7. Signal operator to extend cylinders with mode switch. Cylinders will extend and remain pressurized.
8. Verify safety latches are latched to prevent cylinders from retracting.
9. Continue raising boom and jib to working position.

Procedure For Lowering Boom And Jib

1. Lower boom and jib. With jib in dolly, boom down until boom to jib angle is 140°.
2. Release jib safety latch with hand winch in jib top.
3. Signal crane operator to retract cylinders with mode switch.
4. Release tension on safety latch cable allowing enough slack for engagement when cylinders are extended.
5. Continue lowering boom slowly verifying that stops do not engage pins in boom top.
6. Continue to lower boom and jib to ground.
7. Signal crane operator to extend cylinders with mode switch. If cylinders do not extend automatically, manually pump cylinders to extended position.

Periodic Check Of Oil Level

See Section 5 of this manual for oil change interval and instructions.

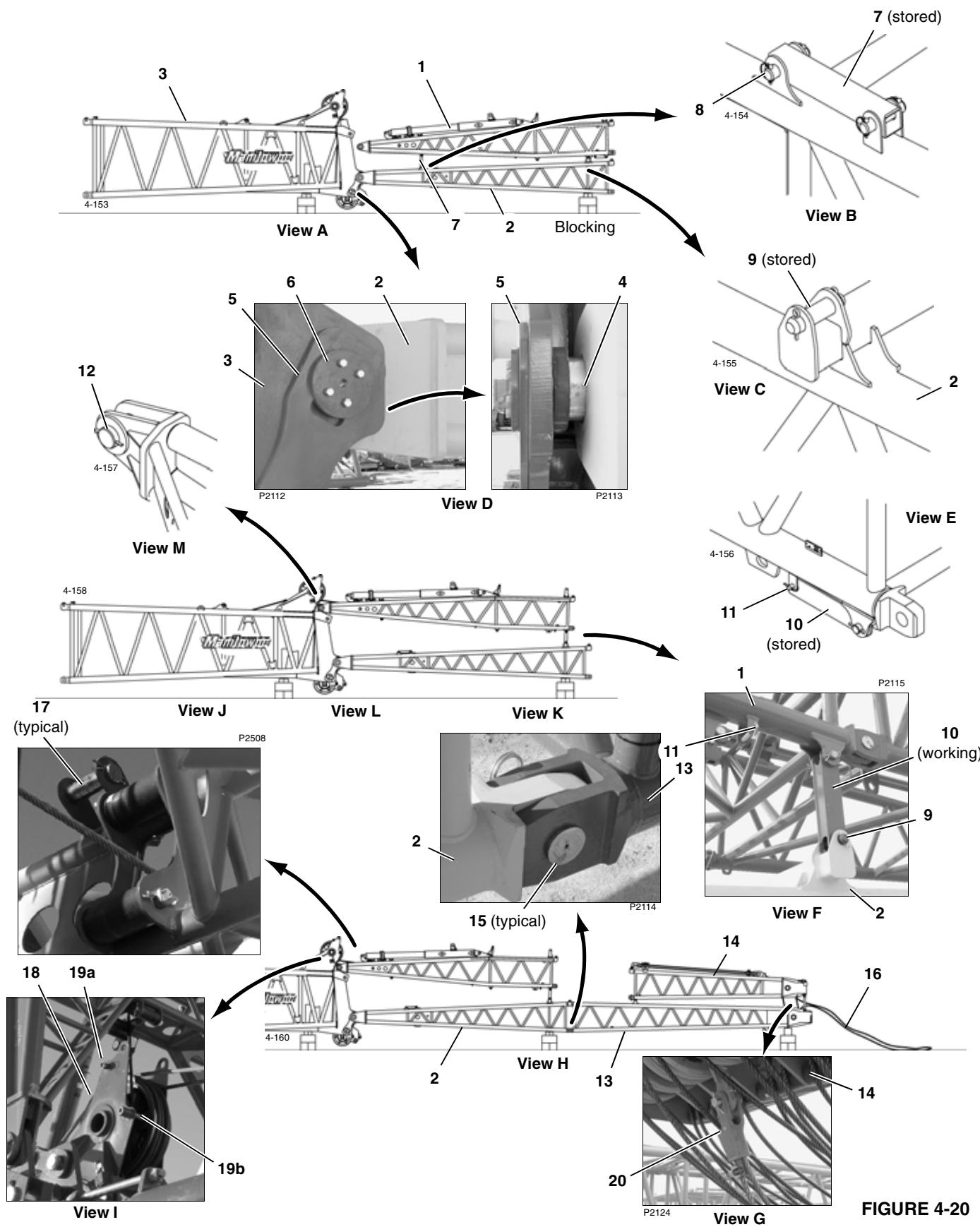


FIGURE 4-20

Installing #79A Luffing Jib

Install Jib and Main Strut Butts

See Figure 4-20 for following procedure.

NOTE: Main strut butt (1) and jib strut butt (2) are shipped together as shown in View A. Main strut butt is above jib strut butt.

1. Using appropriate slings, lift jib strut/main strut butts into position at boom top (3) and align jib strut butt connecting holes (View A).
 2. Connect jib strut butt (2) to boom top (3) with connecting pins (4, View D) (pin heads toward outboard side).
 3. Securely fasten keeper plates (5, View D) to pins (4).
 4. Temporarily attach end plates (6, View D) over ends of pins (2). Block top end of jib strut butt approximately 3 ft (0,9 m) high.
 5. Lower main strut/jib strut butts onto blocking about 3 ft (0,9 m) high.
 6. Support main strut butt (1) with slings from assist crane, and remove shipping pins (9, View A).
 7. Remove pin (8, View A) from strut support A (7).
 8. Rotate strut support A (7) to stored position on jib strut butt and connect to lugs with pin (8) (View B).
- Main strut butt is now separated from jib strut butt.
9. Lift main strut butt about 1 ft (300 mm) clear of jib strut butt.
 10. Store shipping pins (9, View C) in lugs on jib strut butt.
 11. Lift main strut butt (1) into position at boom top (3) and align connecting holes.
 12. Using pins (12, View M), connect main strut butt to boom top.
 13. Remove strut supports B shipping pins (11, View E).
 14. Rotate strut supports B (10, View F) to working position.
 15. While lowering main strut butt (1), guide saddles in strut supports B (10) to rest on pins (9, View C) attached to lugs on jib strut butt.
 16. Disconnect assist crane from lifting slings.

Install Jib Strut Top

See Figure 4-20 for following procedure.

NOTE: Main strut top and jib strut top are shipped together as shown in View H. Main strut top is above jib strut top.

1. Using appropriate slings attached to main strut top (14, View H), lift jib strut/main strut tops into position at jib strut butt (2). Adjust slings so butt end of top is higher than top end.
2. Position jib strut top (13) so bottom connecting holes in strut top line up with connecting holes in jib strut butt (2).
3. Install connecting pins (15, View K) and safety pins (pin heads facing outboard side).
4. Lower jib strut top onto blocking 3 ft (0,9 m) high.
5. Disconnect assist crane from slings. Remove slings.

Install Luffing Hoist Wire Rope

Shipping jib strut top (13) and main strut top (14) assembled as shown in Figure 4-20, View H allows reeving a sucker line through the luffing sheaves in the strut tops. See Luffing Jib Rigging Drawing for wire rope specifications.

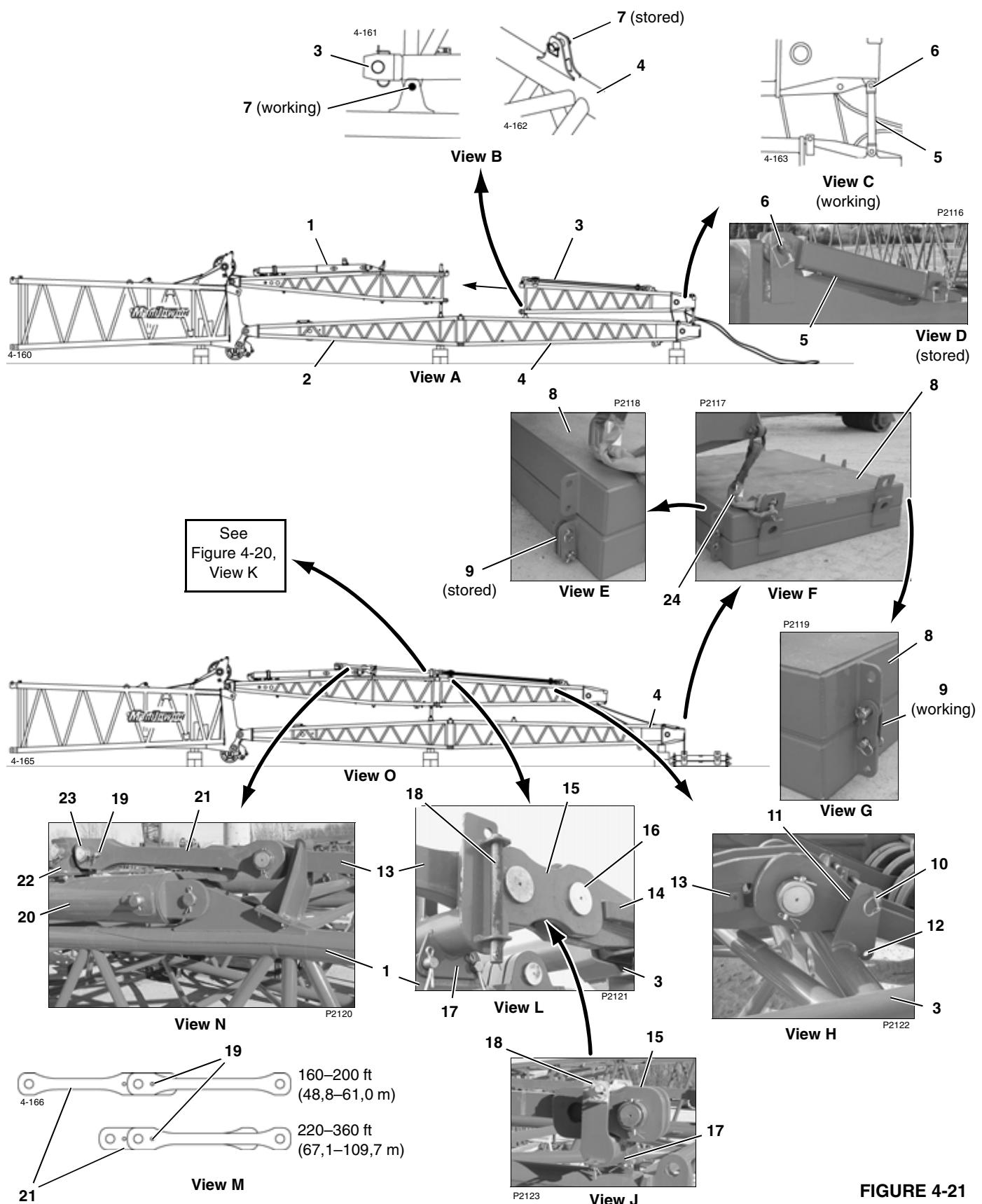
- Make sure wire rope is properly anchored to Drum 6 (luffing hoist) and tightly spooled onto drum.
- Make sure Drum 6 wire rope guide is raised in 40 ft (12,2 m) boom insert.
- Make sure wire rope passes under lower sheave and over upper sheave in 40 ft (12,2 m) boom insert.
- Make sure wire rope passes under sheave in boom top wire rope guide and rollers (17, View J) in main strut butt.
- Pull out upper wire rope guide bar (19a, View I) to the left about half way. Remove lower wire rope guide bar completely (19b). **If this step is not performed, wire rope damage can occur when main strut is raised.**

Do not remove upper wire rope guide bar completely. You will not be able to reinstall it after main strut is raised.

- Route wire rope through proper sheaves as shown in reeving diagram on Luffing Jib Rigging Drawing.
- Pull lead end of luffing hoist wire rope approximately 100 ft (30,5 m) past end of struts and lay on ground. This will allow strut to be raised to erection position.
- Anchor lead end of luffing hoist wire rope to socket (20, View G) in main strut top (14)

Component Identification for Figure 4-20

Item	Description	Item	Description	Item	Description
1	Main Strut Butt	8	Shipping Pin with Wire Lock	15	Connecting Pin with Safety Pin
2	Jib Strut Butt	9	Shipping Pin with Cotter Pins	16	Luffing Hoist Wire Rope
3	Boom Top	10	Strut Support B	17	Roller
4	Connecting Pin	11	Storage Pin with 2 Cotter Pins	18	Wire Rope Guide
5	Keeper Plate	12	Connecting Pin with 2 Cotter Pins	19a	Wire Rope Guide Bar (upper)
6	End Plate	13	Jib Strut Top	19b	Wire Rope Guide Bar (lower)
7	Strut Butt Support A	14	Main Strut Top	20	Dead End Socket

**FIGURE 4-21**

Install Main Strut Top

See Figure 4-21 for following procedure.

Connect Main Strut Top to Strut Butt

1. Support main strut top (3, View A) with slings from assist crane. Adjust slings so butt end of top is higher than top end.
2. Remove rear shipping pins (7, View B).
3. Remove pins (6, View C) from strut support C.
4. Lift main strut top clear of jib strut top.
5. Store rear shipping pins (7, View B) in lugs on jib strut top.
6. Rotate strut supports C (5, View D) into stored position and pin to jib strut top with shipping pins (6).
7. Move strut top slowly to the rear while paying out luffing hoist wire rope from Drum 6 so that wire rope between struts pays out smoothly without kinking or binding.
8. When sufficient wire rope has been paid out, position main strut top in front of main strut butt (View O).

Install bottom and top connecting pins (15, Figure 4-20, View K) and safety pins.

- NOTE:** Top connecting pins are 2 in (51 mm) in diameter. Bottom connecting pins are 2-1/2 in (64 mm) in diameter.
9. Raise insert until top connecting holes line up and install connecting pins and safety pins.
 10. Disconnect assist crane from slings. Remove slings.

Connect Backstay Straps

1. Remove shipping pins (10, View H) from strap brackets (11) and store in hole (12).
2. Remove shipping pins (18, View J) from straps on main strut butt. Store in brackets (17, View L).

3. Rotate links (15, View L) forward and pin to links (14) using pins (16) stored in links (15) (pin heads facing outboard side).

Install collars, retaining pins, and cotter pins.

4. Remove pins (23, View N) securing adjustable straps (21) to shipping brackets (22) mounted on strut stop cylinders (20). Pins (23) will be used to attach adjustable links to backstay straps on boom butt.
5. If necessary, adjust length of adjustable links (21) for boom length (View M).

Connect Jib Strut Top to Counterweight**WARNING****Falling Equipment Hazard!**

Counterweight is required to prevent jib strut from rising when main strut is raised with luffing hoist.

If counterweight becomes disconnected from jib strut, jib strut will rise part way and then both struts could fall forward violently. Minimum capacity required for slings is 25,000 lb (11 340 kg) per side.

1. Remove one top crane counterweight box from each side of crane counterweight. Boxes must be equipped with tie link lugs.
2. Stack counterweight boxes (8, View F), one at a time, at jib strut top (4, View O).
3. Secure lifting lugs on top counterweight box (5) to lugs on jib strut top (4) with shackles and suitable slings (24, View F).
4. If desired, front counterweight tie links (9, View G) may be connected at this time. *Do not connect rear counterweight tie links (9, View E).*

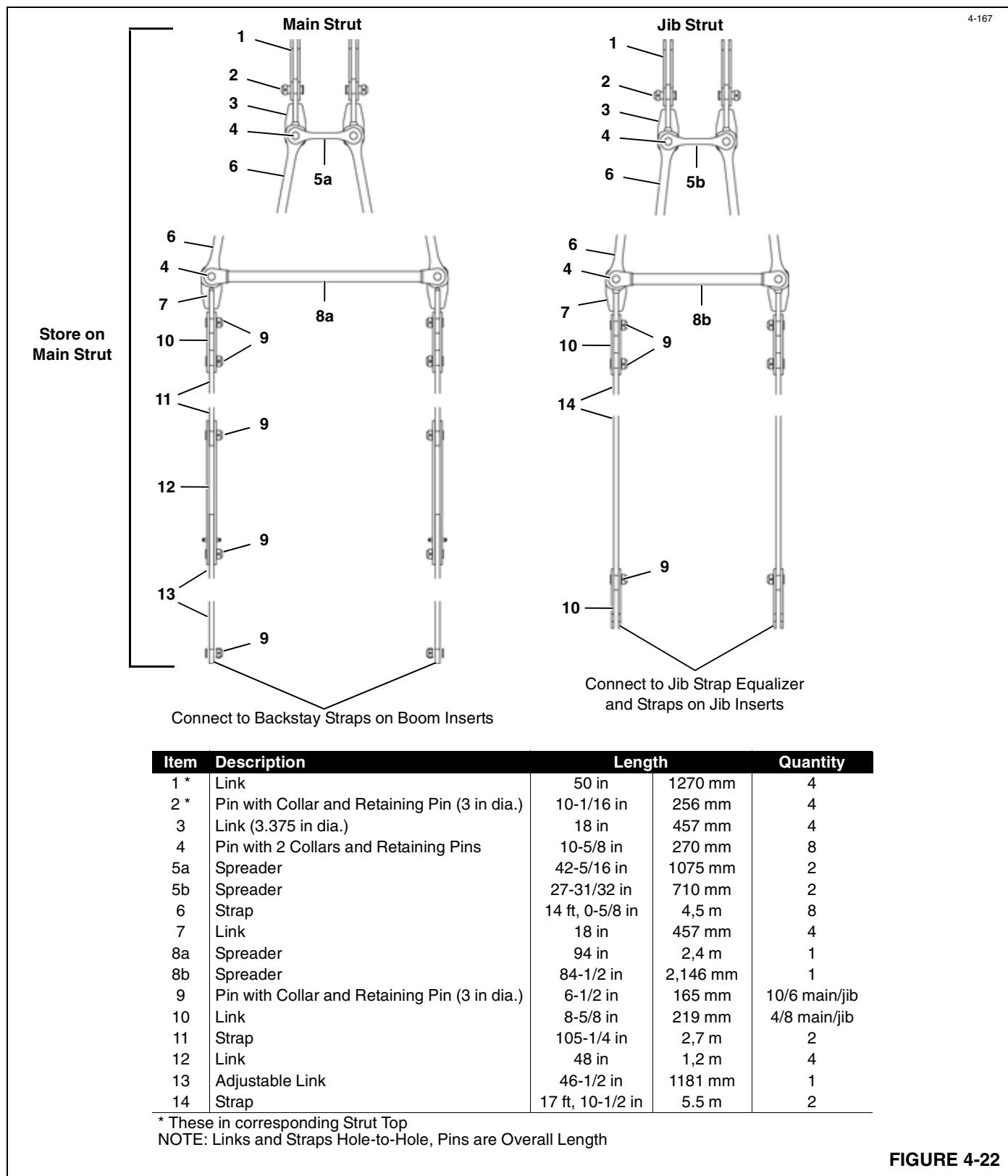
Component Identification for Figure 4-21

Item	Description	Item	Description
1	Main Strut Butt	13	Backstay Strap
2	Jib Strut Butt	14	Link
3	Main Strut Top	15	Connecting Link
4	Jib Strut Top	16	Connecting Pin with Collar, Retaining Pin and Cotter Pins
5	Strut Support C	17	Removable Strap Bracket
6	Pin with Wire Locks	18	Strap Shipping Pin with Cotter Pin
7	Pin with Wire Locks	19	Retaining Pin with Cotter Pins
8	Crane Counterweight Boxes	20	Strut Stop Cylinder
9	Counterweight Tie Links	21	Adjustable Link
10	Strap Shipping Pin with Snap Pins	22	Strap Bracket
11	Strap Bracket	23	Connecting Pin with Collar, Retaining Pin and Cotter Pins
12	Storage Hole for Shipping Pin	24	Sling and Shackle

Install Backstay Straps on Main Strut

1. Install backstay straps on main strut as shown in Figure 4-22.

2. Adjust length and position of straps (14) as shown on Luffing Jib Rigging Drawing.

**FIGURE 4-22**

Raise Main Strut

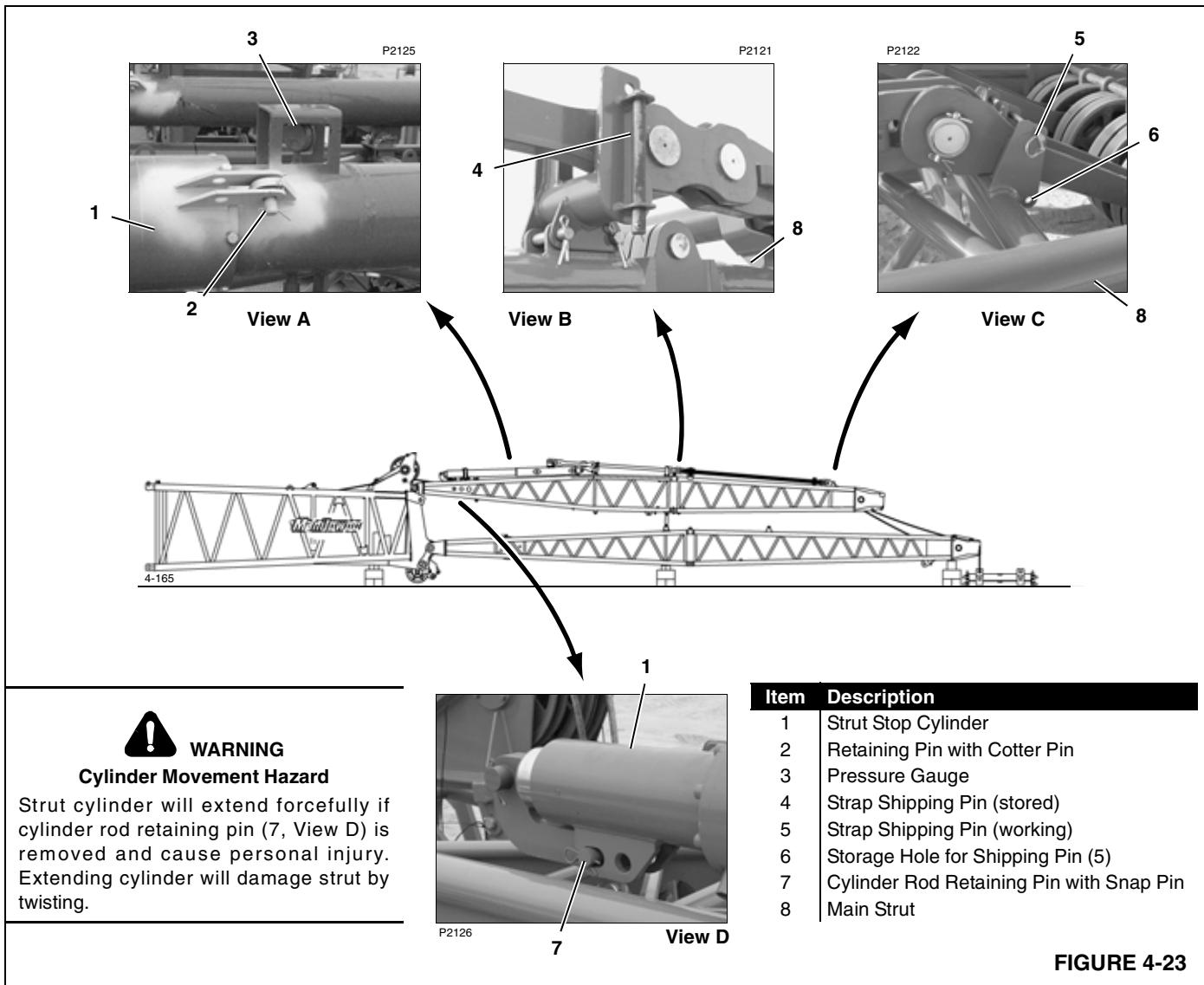
See Figure 4-23 for following procedure steps.

1. Make sure all strap storage pins (4, View B; 5, View C) on main strut (8) are stored.
2. Check that strut raising pendants are lying over strut backstay straps.
3. Verify that top of jib strut is properly anchored to counterweight (Figure 4-21, Views E, F, and G).
4. Check strut stop cylinder to verify the following:
 - Strut stops (1) are fully retracted and retaining pins (2, View A) are installed.
 - Strut stops are pinned to strut butt. ***Do not remove pin (7, View D).***

- Precharge pressure on strut stop pressure gauges (3, View A) corresponds to pressure in the following table:

Ambient Temperature	Pressure
Interpolate as Required	
30°F (-1°C)	230 ± 5 psi (15,8 ± 0,3 bar)
50°F (10°C)	240 ± 5 psi (16,5 ± 0,3 bar)
70°F (21°C)	250 ± 5 psi (17,2 ± 0,3 bar)
90°F (32°C)	260 ± 5 psi (17,9 ± 0,3 bar)

If difference in strut stop cylinder pressure is greater than 5 psi (0,3 bar) or pressures are not within limits specified in the preceding table, contact factory for assistance.



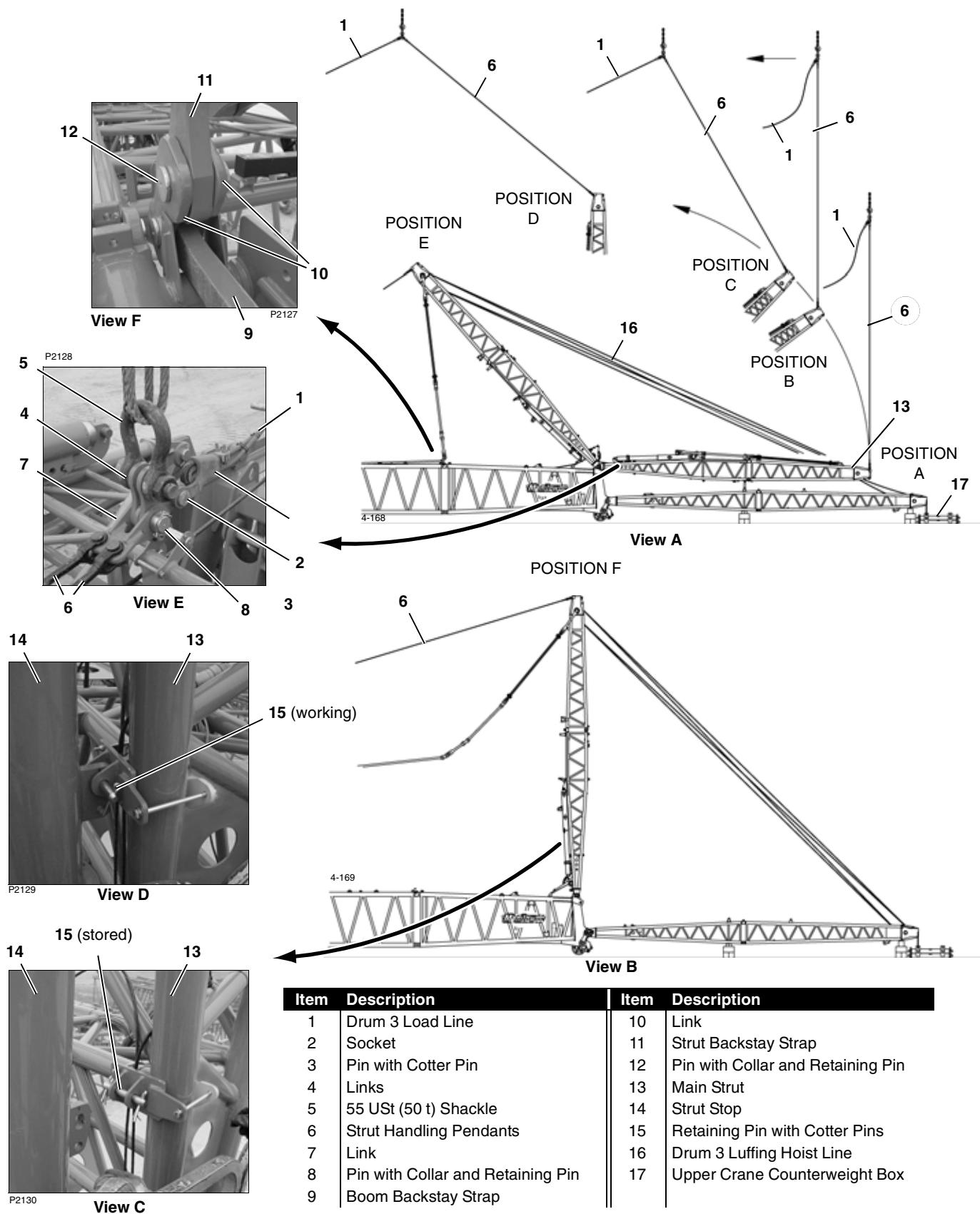


FIGURE 4-24

Raise Main Strut (continued)

See Figure 4-24 for following procedure steps.

5. Attach assist crane to main strut lifting links (4, View E) with user-supplied 55 USt (50 t) shackle (5, View E).
6. Connect Drum 3 load line (1) to links (4) as shown in View E.
 - Use same socket used to anchor load line to boom or jib point.
 - Make sure Drum 3 load line passes over Drum 3 guide sheave in mast.
 - Make sure Drum 3 load line passes through center of the slack boom hoist wire rope reeving and over the boom hoist equalizer (which should be resting on boom rails).

NOTE: After the main strut is fully raised, it will be necessary to lift the boom hoist equalizer slightly to pass the load line under the equalizer.

7. Remove pins (8, View E) from links (4) on main strut (13) and raise links 2 - 3 ft (0,6 - 0,9 m). Store pins (8) in same holes after links are raised.
8. Slowly raise pendants (6) until it is taut (POSITION A, View A). Pay out Drum 3 load line (1), if required.
9. Continue to hoist pendants (6) to raise main strut (13) to POSITION B. Pay out Drum 3 load line (1) and luffing hoist wire rope (16) as strut rises.

Keep pendants (6) vertical during this step.

NOTE: Control hoist speed by observing upper counterweight box (17, View A). Upper box must not lift off lower box during strut raising procedure.

CAUTION**Overload Hazard!**

Do not allow upper crane counterweight (17) box to lift off lower box at any time during strut raising procedure. Load line and pendants could be overloaded, possibly resulting in damage.

10. Once main strut is at approximately 45° (POSITION C, View A), slowly haul in Drum 3 load line (1) while paying out luffing hoist wire rope (16).

11. Follow with assist crane — pay out load line and travel —while performing step 10.

Do not induce any side load in main strut with assist crane. Load line from assist crane should remain vertical during strut raising procedure.

12. When main strut is approaching vertical — POSITION D, pay out load line from assist crane so that pendants (6) and Drum 3 load line (1) start to pull in a straight line.

13. Continue to luff down and haul in Drum 3 load line (1) while following with assist crane to lower main strut until backstay straps can be connected (POSITION E).

Watch closely as strut lowers so that load line does become tangled in boom hoist equalizer. Signal operator as required.

14. Connect backstay straps (11) to connecting links (10) using pins (12) (View F).

15. Connect rear tie links (9, Figure 4-21, View E) between two crane counterweight boxes at jib strut top.

16. Slowly luff up to raise main strut to POSITION F.

17. Remove retaining pins (15, View D) from strut stops (14).

Support strut stops when removing pins. Strut stops will swing away from main strut.

18. Store pins (15) in lugs on main strut (13, View C).

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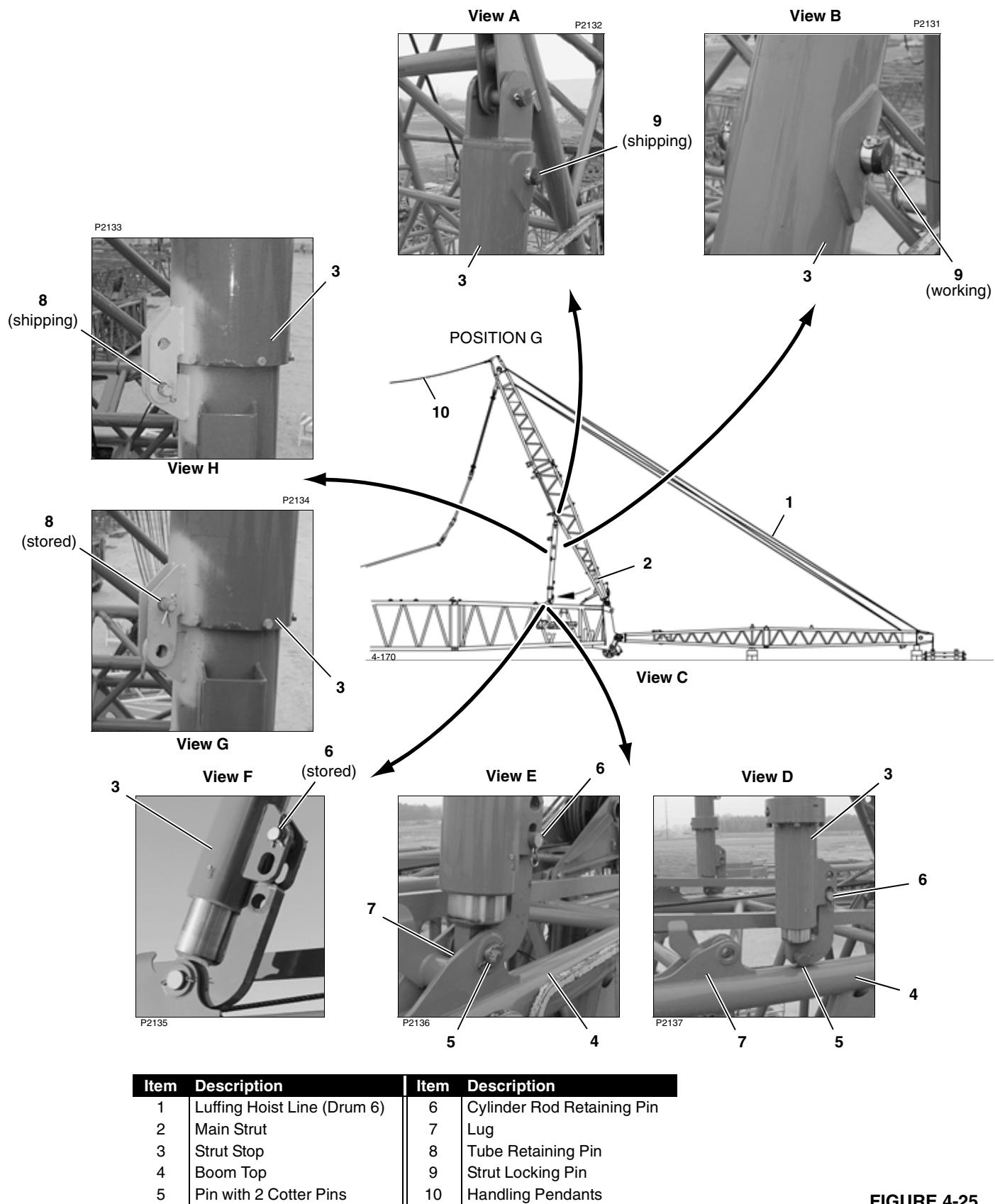


FIGURE 4-25

Raise Main Strut (continued)

See Figure 4-25 for following procedure.

19. Slowly luff down to lower main strut (2) to rear – POSITION G (View C). Stop when strut stops (3) are just above boom top (4) as shown in View D.
20. Remove pins (5, View D).

**WARNING****Cylinder Movement Hazard**

Strut cylinder will extend forcefully if cylinder rod pin (6, View D) is removed and cause personal injury. Extending cylinder will damage strut by twisting. Strut may fall.

21. Swing strut stops (3) to rear and position main strut (2) as needed to align holes in strut stop (3) with lugs (7) on boom top (View E).
22. Pin strut stops (3) to lugs (7) on boom using pins (5) (View E).
23. Remove tube retaining pins (8, View H) and store as shown in View G.
24. Remove strut locking pins (9, View A) from stored position.
25. Insert pins (9) in lower holes on outer stop tube (View B). Luff up as needed to align holes in strut stops.
26. Pull strut slightly to rear by slowly hauling in Drum 3 hoist line slightly to remove load on cylinder rod retaining pins (6, View E).

CAUTION**Strut Damage!**

Pulling strut too far to rear will damage strut and/or strut stop cylinders.

27. Remove retaining pins (6, View E) and store as shown in View F.
28. Slowly pay put Drum 3 hoist line. Cylinder rods will extend, allowing strut to rotate forward (View F).
29. Store handling pendants (10) and links:
 - a. Leave assist crane attached to the links at end of handling pendants (10).
 - b. Lower links with assist crane and pay out Drum 3 hoist line until handling pendants are hanging vertically between backstay straps. Pendants will lie against cross brace between straps.
 - c. Disconnect Drum 3 hoist line from links and lay hoist line on top of boom.
 - d. Disconnect one handling pendant from links and allow to pendant to hang vertically.
 - e. Use assist crane to lift other pendant (with links) back up and outside of jib backstay straps. Lower pendant to vertical and disconnect assist crane from links.
 - f. Repeat step 29e for other pendant.
 - g. Reconnect pendant to links and pin links with handling pendants to jib strut butt.
 - h. Use assist crane to lift Drum 3 hoist line into position behind boom hoist equalizer. Haul in excess line on Drum 3.
 - i. If Drum 3 hoist line will not be used, store it on Drum 3.
30. Disconnect crane counterweight from jib strut top (Figure 4-21, View F).
31. Disconnect tie links from counterweight boxes (Figure 4-21, Views E and G).
32. Remove boxes, one at a time, and install. Place one box on each side of crane counterweight
33. Reinstall wire rope guide bars (19a and 19b, Figure 4-20, View I).

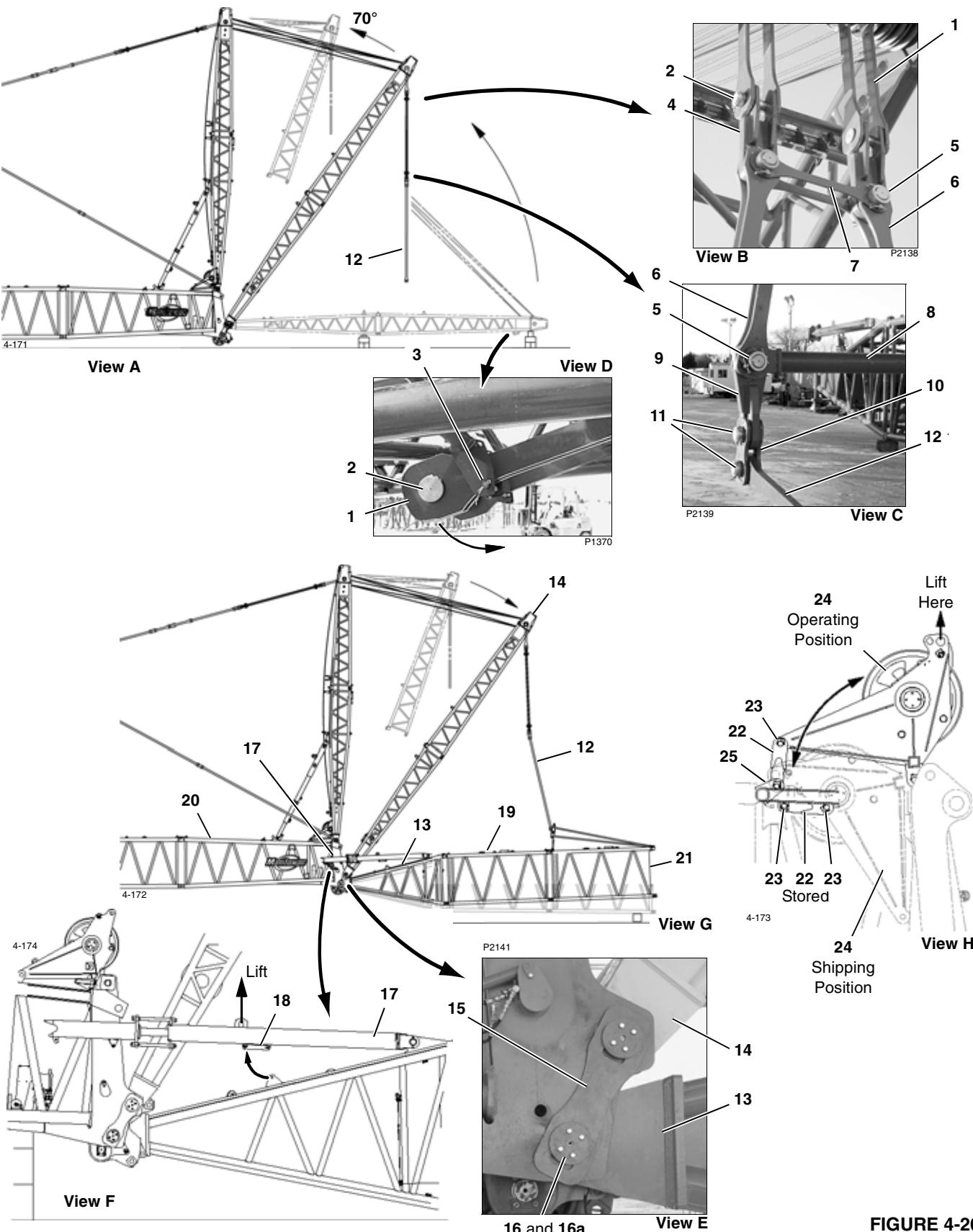


FIGURE 4-26

Raise Jib Strut

See Figure 4-26, Views A – D for following procedure.

1. Slowly luff up to raise end of jib strut to desired working height.
2. Support links (1) so they cannot fall and remove link storage pins (3) from shipping holes (View D).
3. Lower links (1). Store link storage pins (3) in shipping holes.
4. Connect links (4), spreaders (7, 8), and jib straps (6) to jib strut (14) as jib strut is raised (Views B and C).
5. Attach a 20 ft (6,1 m) long sling to end of each strap (12). Slings will be used to pull jib strut down later in procedure.
6. Slowly luff up to raise jib strut to no higher than 65° to 70° as shown in View A.

Install Jib

See Figure 4-26, Views E – G for following procedure.

NOTE: Jib assembly is identical to boom assembly. The following instructions assume that assembly personnel already know how to assemble the boom (jib) sections. If in doubt, see Boom Rigging Guide in Crane Operator's Manual.

See Luffing Jib Assembly drawing at end of this section for proper positioning of jib sections.

1. Install Jib Butt and First Two Inserts:

- a. Assemble jib butt (13) and first two inserts (19, 21) on blocking in front of boom.
- b. Using nylon slings and a four point hookup from assist crane, hook onto butt and first two inserts.

Wrap slings around chords only. *Do not use lifting lugs on butt or inserts and do not lift against lacings.*

- c. Lift jib butt and inserts into position at end of boom top (20) as shown in View G.
 - d. Guide jib butt as required so jib stops (17) are outside of jib strut (14) as shown in View F.
 - e. Align connecting holes in jib butt (13) with holes in boom top (20) and install keeper plates (15, View E) and end plates (16).
 - f. Apply Loctite to jib strut and jib butt keeper plate cap screws. Securely tighten keeper plate screws. Torque to 100 ft-lb (136 N•m).
 - g. Lower jib butt and inserts onto blocking approximately 8 in (203 mm) high.
 2. Assemble remaining jib inserts and jib top in proper sequence as shown on Luffing Jib Rigging Drawing.
 3. Unpin jib straps from stored position on inserts and connect links between straps.
 4. Raise jib top wire rope guide:
- See Figure 4-26, View H for following procedure.
- a. Remove links (22) and pins (23) from storage.
 - b. Support wire rope guide (24) with slings from assist crane.
 - c. Remove pins (23) from lugs (25).
 - d. Raise wire rope guide (24) to operating position.
 - e. Pin links (22) to wire rope guide (24) and to lugs (25) with pins (23). **Wire rope will rub on jib point if links are not installed.**
 - f. Store extra two pins (23) in link storage lugs.

Component Identification for Figure 4-26

Item	Description	Item	Description
1	Links (4)	14	Jib Strut (1)
2	Pin w/Collar and Retaining Pin (2)	15	Keeper Plate (2)
3	Link Storage Pin (2)	16	Pin (2)
4	Link (2)	16a	End Plate with Cap Screws (4)
5	Pin w/Collar and Retaining Pin (4)	17	Jib Stop
6	Strap (4)	18	Jib Stop Support
7	Spreader (2)	19	20 ft (6,1 m) Jib Insert with Bracket Lugs*
8	Spreader (1)	20	Boom Top
9	Link (2)	21	20 ft (6,1 m) or 40 ft (12,2 m) Insert*
10	Link (4)	22	Link (2)
11	Pin w/Collar and Retaining Pin* (4)	23	Pin with Snap Pins (6)
12	Jib Strap (2)	24	Wire Rope Guide
13	Jib Butt (1)	25	Lug (2)

Number in parenthesis () equal quantity.

* See Luffing Jib Assembly drawing for quantity and installation location.

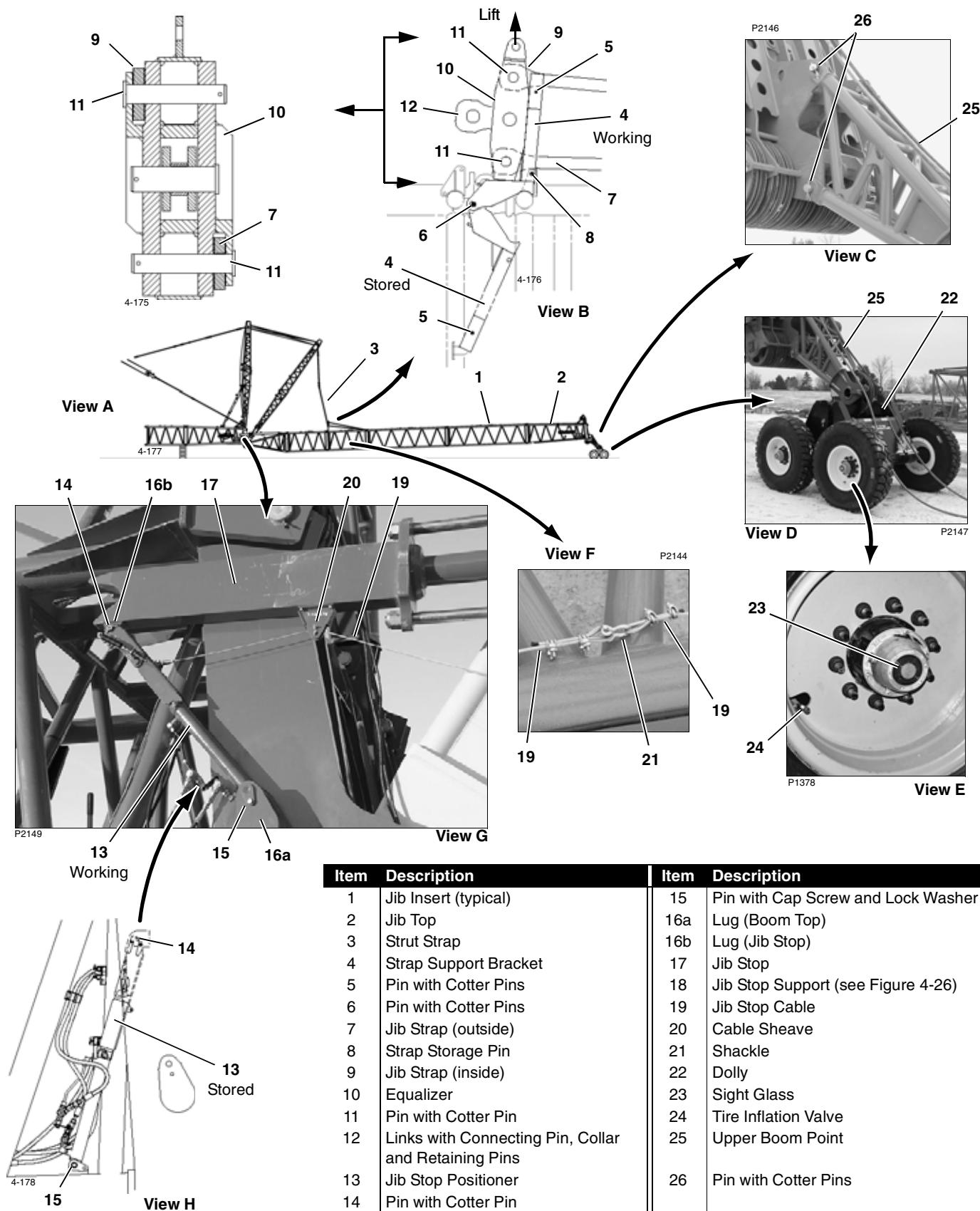


FIGURE 4-27

Install Jib Strap Equalizers

See Figure 4-27, View B for following procedure.

1. Remove strap support brackets (4) from stored position and install in working position.
2. Rest outside strap (7) on top of strap storage pin (8) (installed in strap support on insert).
3. Rest inside strap (9) on top of pin (5) (installed in strap support bracket).
4. Remove pins (11) from equalizer (10).
5. Lift equalizer (10) into position at ends of straps (7 and 9).
6. Pin equalizer to straps (7 and 9) with pins (11).

Connect Jib Strut Straps to Equalizers

See Figure 4-27 for following procedure.

1. Using assist crane connected to slings on strut straps (3, View A), pull jib strut forward and down until strut straps can be connected to equalizer links.
2. Pay out luffing hoist wire rope as strut is pulled forward.
- NOTE:** Jib strut is not heavy enough to overhaul luffing hoist wire rope. Approximately 15,000 lb (6 804 kg) of pull is required.
3. Pin strut straps (3) to equalizer links (12, View B) with pin heads facing outside of jib.

Complete Jib Assembly

1. Install jib stop positioner, one side at a time:

See Figure 4-26, View F for steps a - c in following procedure.

- a. Attach assist crane to lifting lug on jib stop (17, View F).
- b. Support jib stop with assist crane and unpin jib stop support (18) from jib butt.
- c. Pin support to jib stop for storage.

See Figure 4-27 for steps d - h in following procedure.

- d. Loosen spring tension on positioner safety latch only enough to allow removal of pins (14 and 15, View H).

- e. Remove jib stop positioner (13) from storage (View H).

- f. Pin jib stop positioner (13, View G) to lug (16a) on boom top and to lug (16b) on jib stop (17).

- g. Disconnect assist crane.

- h. Tighten eyebolt until positioner safety latch spring is tensioned to approximately 9 in (229 mm) long. (Figure 4-28, View F).

2. Route cable (19, Figure 4-27, View G) through cable sheaves (20) on jib stop and in boom butt and pin cable to jib stop.

3. Connect other end of cable to cable from hand winch as shown in View F.

Prepare Jib Dolly

See Figure 4-27 for following procedure.

Check following items each time dolly (22, View D) is used:

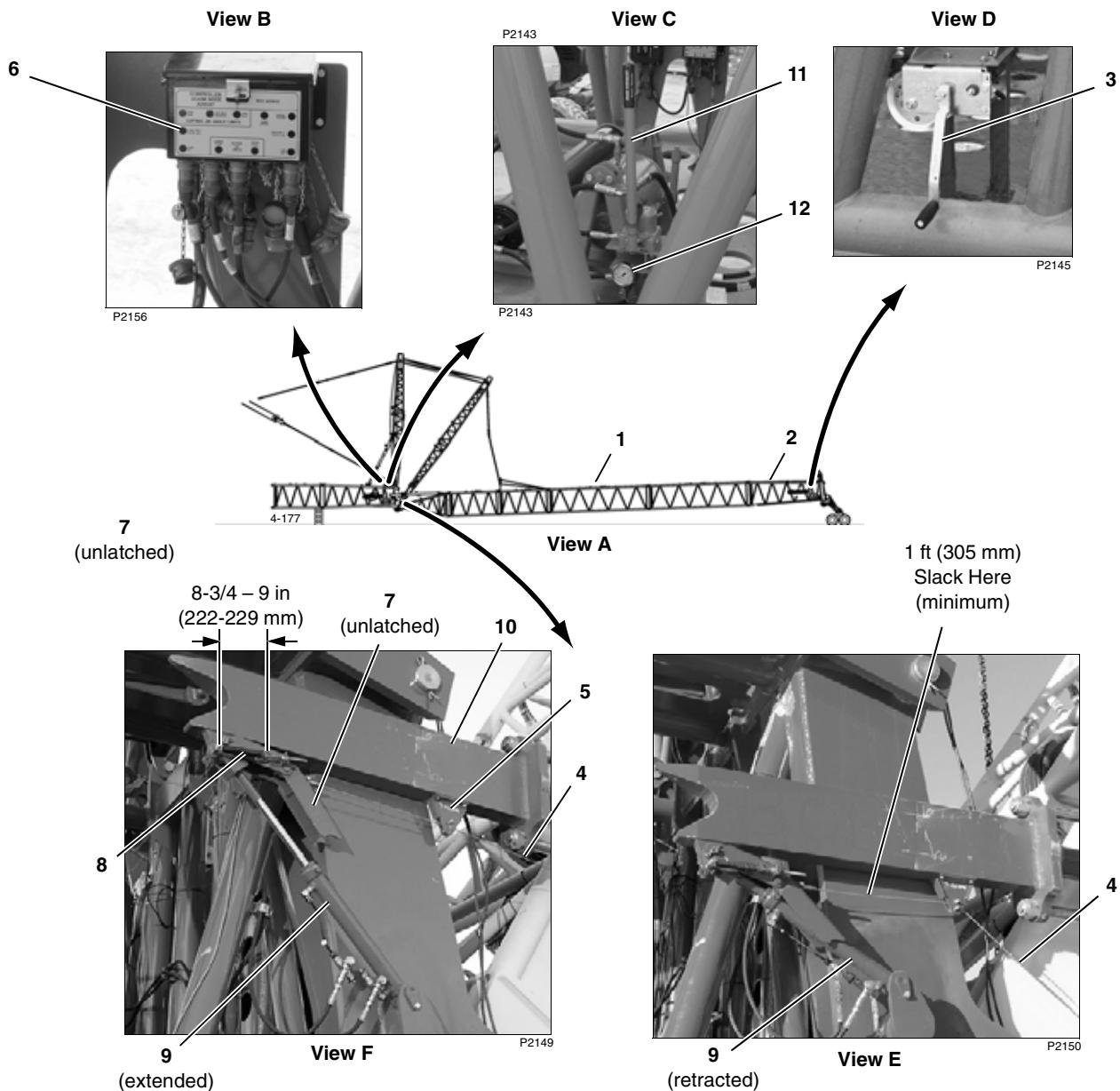
1. Tire pressure at inflation valve (24, View E). Inflate to 112 psi (7,7 bar).
2. Oil level in wheel hubs. Fill, if required, to FULL ring in sight glass (23, View E). Use same gear oil used in drum planetaries on crane.

Install Jib Dolly

See Figure 4-27 for following procedure

An assist crane capable of lifting half the weight of the jib is required for the following procedure. A fork-lift truck is required to handle the upper jib point.

1. Attach slings from assist crane to end of jib top.
2. Lift jib top with assist crane.
3. Install upper jib point:
 - a. Using a fork-lift truck, lift upper jib point (25, View C) into position at jib top.
 - b. Pin upper jib point to jib top with pins (26, four places).
 - c. Remove fork-lift truck.
4. Position dolly (22, View D) under upper jib point (25) with the longest guide forward and to the right.
5. Lower jib top so upper point engages saddles in dolly.
6. Disconnect assist crane.



Item	Description	Item	Description
1	Jib Insert (typical)	7	Safety Latch
2	Jib Top	8	Spring
3	Hand Winch	9	Hydraulic Cylinder
4	Cable	10	Jib Stop
5	Cable Sheave	11	Pump Handle
6	Junction Box	12	Pressure Gauge

FIGURE 4-28

Install Jib Load Line

Route load lines through proper guide sheaves on boom butt, on boom top, and in jib strut. The position of the guide sheaves in the strut must match the guide sheaves on the boom top.

Pull load lines approximately 40 ft (12,19 m) past end of jib and lay them on ground. Securely fasten load lines to jib point. Install load block after boom and jib have been jack-knifed into position and dolly has been removed.

NOTE: Load block(s) will be installed after boom and jib are jack-knifed to required angle.

**WARNING****Falling Wire Rope Hazard!**

For long boom and short jib combinations, wire rope on boom side of attachment can overhaul unsecured wire rope on jib side of attachment. Wire rope could fall off boom. Securely fasten load line to jib point before raising attachment.

Connect Electric Cords/Adjust Electronic Devices

1. Connect electric cords to respective junction boxes and switches. See Boom Wiring Diagram at the end of this section.
 - Angle indicator on jib butt.
 - Jib stop limit switches on boom top.
 - Block-up limit reel in jib butt.
 - Block-level sensor switches.
 - Jib stop positioner electrical valve.
 - For hard-wired load links (if equipped): install load link, associated links, and swivel. Route and secure load link cord so that during erection and operation the link can pivot without pulling on the cord or interfering with other parts.
2. Connect all unused electric cords to proper terminating plugs on junction boxes.

NOTE: Block-up limit electric cords will be connected to limit switches after boom and jib are jack-knifed to required angle.

3. Adjust electronic devices according to instructions in Section 6 of this manual:
 - Boom stop.
 - Luffing jib stop limit switches.
 - Jib angle indicator.
 - Block-level sensor switches (in this section).

Install Wind Speed Indicator Assembly

Install wind speed indicator if removed for shipping. Use star washers to attach mounting bracket to jib top to provide good a ground (see Wind Speed Assembly drawing at end of this section).

Connect electrical cable at base of wind speed mounting bracket.

Set Up Jib Stop Positioners

See Figure 4-28 for following procedure.

1. Pump hand pump (11, View C) until pressure gauge (12) reads 2500 psi (172,3 bar).
2. Using hand winch (3, View D) in jib top, disengage safety latch (7, View F) in jib butt.
3. Adjust safety latch spring tension if necessary (View F).
4. Signal crane operator in operator's cab to retract positioner cylinders. Weight of jib stops retracts cylinders (9, View E).

**WARNING****Structural Damage!**

Raising boom and jib with jib stop positioner cylinders extended will result in structural damage. Be sure cylinders are retracted.

5. Using hand winch (3, View D) in jib top, release tension on safety latch cable (4).
6. Pay out additional cable and pull cable through jib as needed to provide at least 12 in (305 mm) slack **at safety latch**. Slack is needed to allow latch engagement when cylinders are extended.

Pre-Raising Checks

Make the following checks and correct any defects before raising the attachment.

- All installation steps given in this section performed.
- Boom and jib inserts installed in proper sequence according to Rigging Drawings.
- Boom, jib, and backstay straps installed in proper sequence and unpinned from storage positions.
- All connecting pins installed and properly retained.
- Boom and luffing hoist wire rope anchored properly to drums, spooled tightly onto drums, and engaged with proper sheaves. Make sure rope guard pins, bars, or rollers are installed to retain wire rope in sheaves.
- Main strut raised and strut stop tubes pinned in operating position.

- Main strut cylinders pressurized.
- Jib stop positioner cylinders retracted.
- Load lines anchored properly to drums, spooled tightly onto drums, and engaged with proper sheaves. Make sure rope guard pins, bars, or rollers are installed to retain wire rope on sheaves.
- Load line going to jib point is securely attached to end of jib so load line cannot fall off jib and boom.
- All blocking, tools, and other items removed from boom and jib and from dolly travel path.
- All safety devices installed, electric cords connected, and limits adjusted.
- Raising instructions in this section read and thoroughly understood.
- Proper amount of crane counterweight and, if required, MAX-ER counterweight installed.
- Wind within allowable limits for raising boom and jib.
- All lubrication points greased.

- LUFFING JIB mode selected and confirmed.



WARNING

Falling Boom And Jib Hazard!

Select and confirm LUFFING JIB mode. Operating in any other mode with luffing jib attached is prohibited. Jib stop positioner cylinders are extended and will cause structural damage.

Luffing jib limits are disabled when LUFFING JIB mode is off. Boom and jib could be pulled over backwards.

Raising Boom and #79A Luffing Jib

General

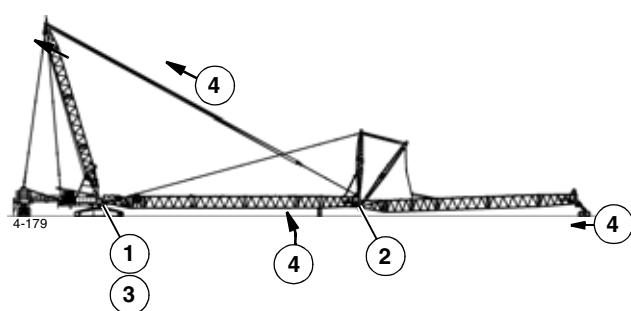
ALL boom and jib combinations must be raised and lowered using **Jack-Knife Method**. See the Liftcrane Luffing Jib Capacities Chart to determine the following:

- Counterweight Requirements (crane and MAX-ER).
- Boom to Luffing Jib Angle.
- Maximum Boom and Jib Lengths Raised or Lowered:
 - Over end of blocked crawlers.
 - Over end or side of unblocked crawlers.

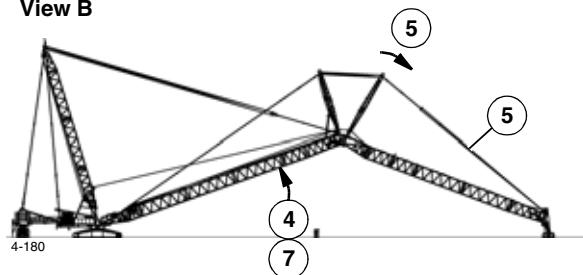
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CIRCLED NUMBERS CORRESPOND TO
JACK-KNIFE RAISING
PROCEDURE STEPS

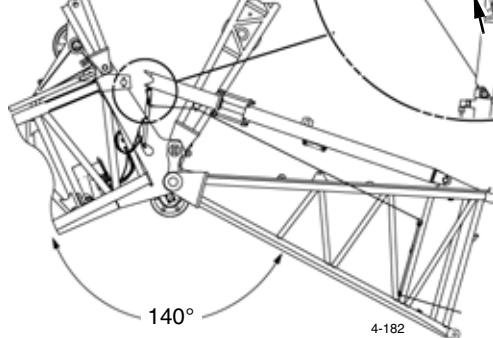
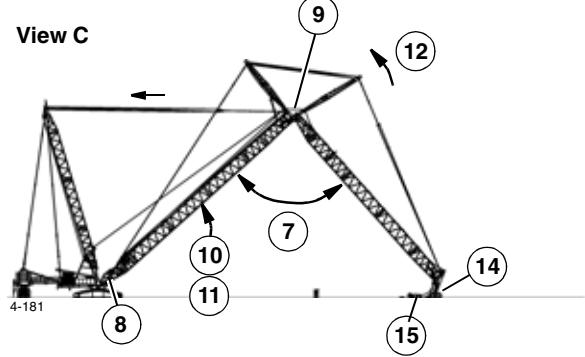
View A



View B



View C



View D

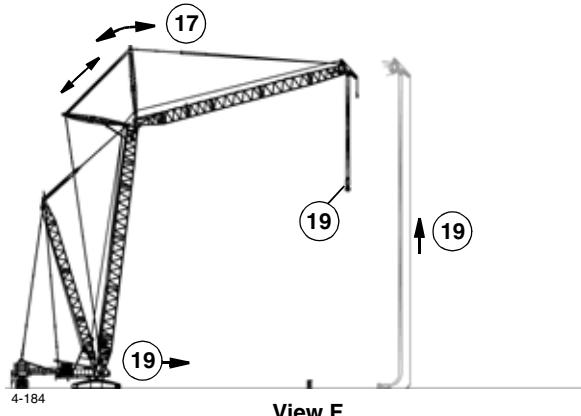
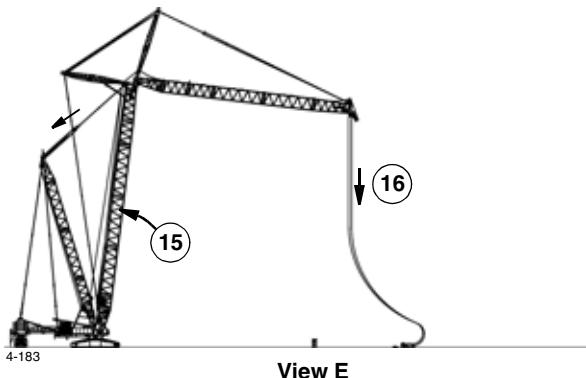


Figure 4-29

Jack-Knife Raising Procedure

Circled numbers in Figure 4-29 correspond to numbered steps in the following procedure.

**WARNING****Moving Part Hazard!**

Warn all personnel to stand clear of jib point dolly while raising boom and jib.

Death or severe crushing injuries will occur if personnel come into contact with dolly.

**WARNING****Tipping Hazard!**

Determine BOOM TO LUFFING JIB ANGLE that boom and jib must be jack-knifed to before jib can be raised (see Raising Procedure Chart). Crane will tip or structural damage will result if specified angle is not adhered to.

Monitor angle on digital display as boom and jib are raised.

CAUTION**Structural Damage!**

Avoid possible structural damage to boom and jib from side loading as boom and jib are raised:

Disengage swing lock and release swing brake until boom and jib have been raised to required boom to luffing jib angle.

Retract jib stop positioner cylinders before beginning to raise boom and jib.

NOTE: It is normal for the following limits to come on during the raising procedure:

BLOCK UP – this fault will go off once the boom and luffing jib are raised and the load lines/block-up limit chains are hanging freely.

MAX UP 1 and MAX UP 2 – these faults go off once boom to luffing jib angle is less than 169.2 to 170°.

See Figure 4-29 for following procedure.

1. Determine boom to luffing jib angle that boom and jib must be raised to before jib can be raised (see Liftcrane Luffing Jib Capacities Chart).
2. Signal crane operator to retract positioner cylinders with mode switch.
3. Disengage swing lock, release swing brake and slowly boom up.

Jib point dolly will roll along ground as boom and jib are jack-knifed into position.

4. Pay out load line as boom and jib are raised.
5. Jib and backstay straps will tighten as boom and jib rise. Signal person, watch jib straps and jib point dolly along left side of jib as boom and jib are raised. Do not allow jib point to rise off dolly.

**WARNING****Tipping Hazard!**

Do not allow jib straps to become too tight during raising steps. Crane will tip or structural damage will result.

Do not allow jib straps to become too slack during raising steps. Straps will bounce against jib inserts, possibly resulting in damage.

Signal operator to pay out luffing hoist wire rope (luff down) so jib straps remain slack. Do not allow straps to become too slack or they will bounce against jib inserts. Keep jib straps 2-1/2 – 3-1/2 ft (0,76 – 1,07 m) above strap supports at end of jib top.

It will be necessary to use limit bypass switch to luff down if BLOCK UP limit is on.

6. Continue slowly with Jack-Knife Raising Procedure.
7. Stop raising boom when boom to jib angle is 140°. **Monitor this angle on digital display.**
8. Signal crane operator to extend positioner cylinders with mode switch. Cylinders will extend and remain pressurized.
9. Verify that safety latches are in position and will prevent cylinders from retracting.
10. Continue slowly with Jack-Knife Raising Procedure.
11. Stop raising boom when boom and jib have been positioned at required boom to luffing jib angle. **Monitor this angle on digital display.**

**WARNING****Falling Jib Hazard!**

Do not position boom and jib at any boom to luffing jib angle less than minimum stop (70°). Structural damage to jib butt will occur, possibly causing jib to collapse.

When boom and jib are at proper angle, jib stop saddles will be in position to automatically engage pins in boom top.

12. Slowly luff up until jib straps start to go into tension and stop.

13. Apply swing brake, boom up to raise jib point clear of dolly, and remove dolly.
14. Install load blocks or weight ball (see Load Block Reeling in this section).



WARNING

Falling Load Hazard!

Do not lift load blocks or weight balls off ground until boom has been raised to desired operating angle and jib has been positioned at required operating radius for load to be handled. Structural damage can occur and attachment can collapse if this precaution is not observed.



WARNING

Falling Load Hazard!

Load lines going up boom can overhaul load lines going down jib. Do not untie load lines from jib until load blocks or weight balls have been installed. Load lines can fall off boom if this precaution is not followed.

15. Slowly raise boom and jib to desired boom angle (see capacity chart for boom angles).
16. Pay out load line as boom and jib are raised.
17. Position jib at required operating radius.
18. Travel forward until load blocks and/or weight balls are directly below jib point.
19. Lift load blocks and/or weight balls to desired position.

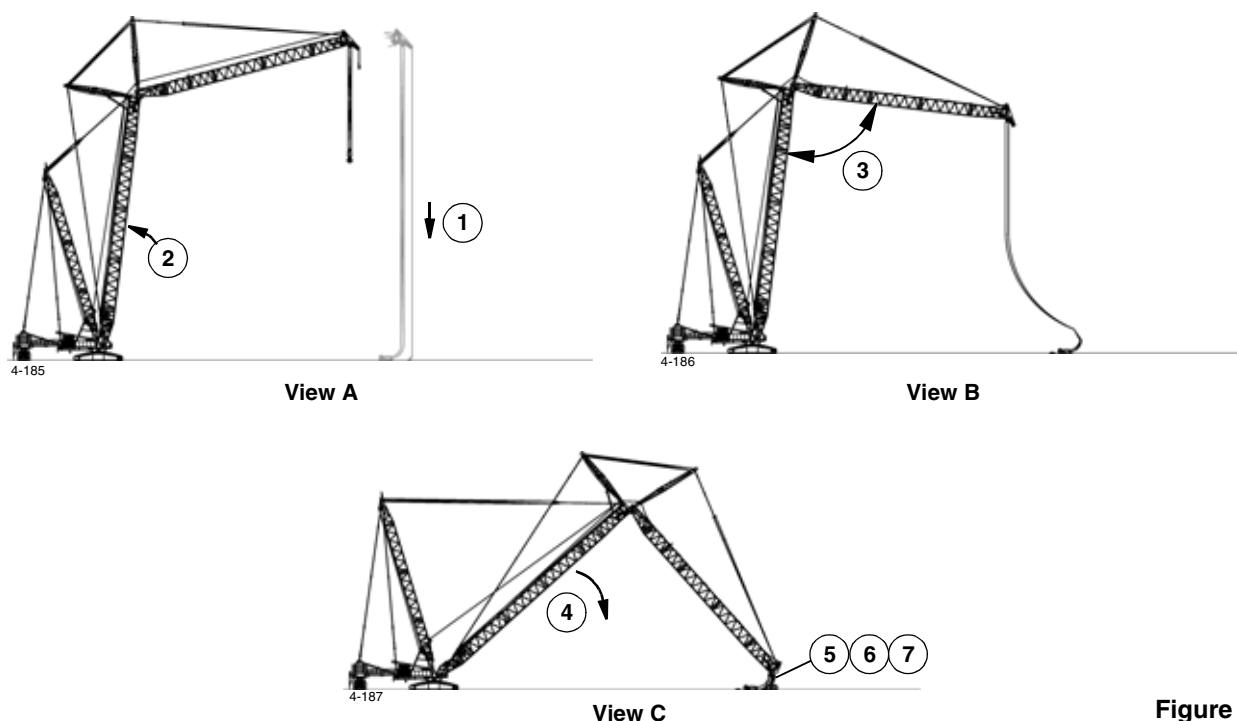


Figure 4-30

Lowering Boom and #79A Luffing Jib

General

ALL boom and jib combinations must be raised and lowered using **Jack-Knife Method**. See the Liftcrane Luffing Jib Capacities Chart to determine the following:

- Counterweight Requirements (crane and MAX-ER).
- Boom to Luffing Jib Angle.
- Maximum Boom and Jib Lengths Raised or Lowered:
 - Over end or side of blocked crawlers.
 - Over end or side of unblocked crawlers.

Jack-Knife Lowering Procedure



DANGER

Moving Part Hazard!

Warn all personnel to stand clear of jib point dolly while lowering boom and jib.

Death or severe crushing injuries will occur if personnel come in contact with tires.

See Figure 4-30 for following procedure.

NOTE: Item numbers in Figure 4-30 correspond to numbered steps in following procedure.

It is normal for the BLOCK UP, MAX UP 1, and MAX UP 2 limits to come on during the lowering procedure.

1. Swing boom and jib slightly to either side of center and lower load block or weight ball onto ground. Then swing boom and jib to desired position with relation to crawlers and apply swing brake.

Adhere to raising and lowering limitations given in Liftcrane Luffing Jib Capacities Chart.



WARNING

Tipping Crane Hazard!

Lower load block or weight ball onto ground before lowering boom and jib. Structural damage can occur and attachment can collapse if this precaution is not observed.



DANGER

Tipping Crane Hazard!

Do not lower boom and jib to ground until boom has been positioned at minimum angle of 85° and jib has been positioned at specified boom to luffing jib angle. Crane will tip, or structural damage will occur, possibly causing attachment to collapse.

2. Raise boom to a minimum angle of 85°.
3. Position jib at required boom to luffing jib angle (see Liftcrane Luffing Jib Capacities Chart).

Monitor angles given in following procedure on digital display.



WARNING

Tipping Crane Hazard!

Do not allow boom to luffing jib angle to become less than 70°. Structural damage to jib can occur.

CAUTION

Structural Damage!

Side loading can cause structural damage to boom and jib as boom and jib are lowered.

Disengage swing lock and release swing brake when jib point rollers contact ground.

CAUTION

Jib Point Damage!

Do not allow upper jib point to contact ground while lowering luffing jib. Damage will occur.

4. Slowly lower boom until upper jib point is approximately 6 ft (1,8 m) off ground.

It will be necessary to use limit bypass switch to lower boom if BLOCK UP limit is on.

5. Remove load blocks or weight balls:
 - a. Remove block-up limit weights and chains and connect block-up limit electric cords to terminating plugs on junction boxes.
 - b. Securely fasten load lines to jib point so load lines cannot fall off boom and jib.

**WARNING****Falling Wire Rope Hazard!**

For long boom and short jib combinations, wire rope on boom side of attachment can overhaul unsecured wire rope on jib side of attachment. Wire rope could fall off boom. Securely fasten load lines to jib point before removing load blocks or weight balls.

6. Check dolly oil level and tire pressure (Figure 4-27, View F).
7. Using a fork-lift truck, lift jib point dolly into position under jib top. Lower boom (and jib) so upper jib point engages saddles in dolly (see Figure 4-27, View F).

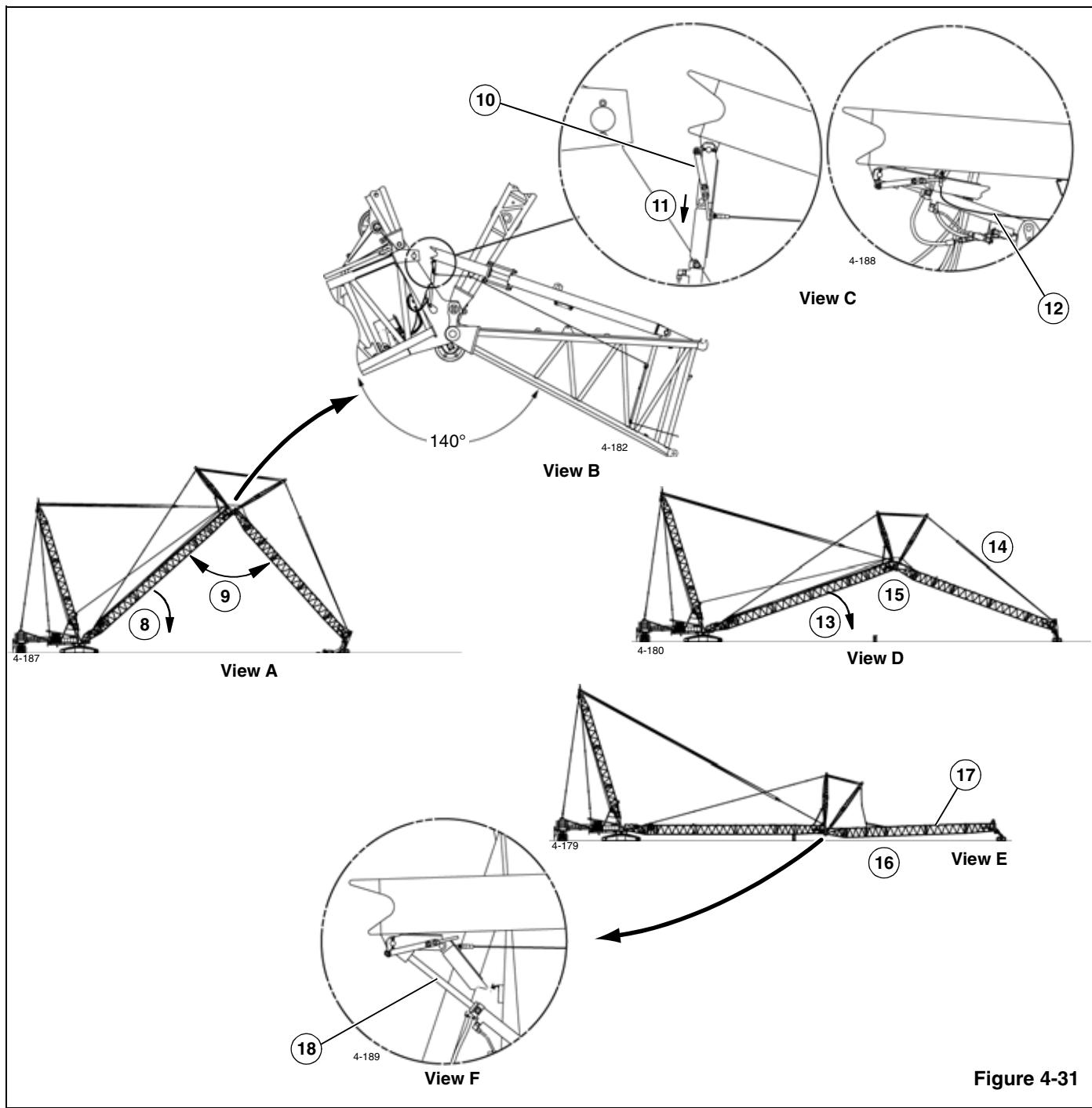


Figure 4-31

Jack-Knife Lowering Procedure (continued)

See Figure 4-31 for following procedure.

8. Release swing brake (disengage swing lock) and slowly boom down. Jib point dolly will roll along ground as boom and jib are lowered.
9. Boom down until boom to luffing jib angle is 140° (View A).
Pay out load lines as boom and jib are lowered.
10. Release jib safety latch with hand winch (3, Figure 4-27, View D) in jib top.
11. Signal crane operator to retract positioner cylinders with the mode switch. Weight of jib struts will retract cylinders (View C).
12. Release tension on safety latch cable allowing enough slack for engagement when cylinders are extended.
13. Continue to boom down slowly.
Pay out load lines as boom and jib are lowered.
Signal person, watch jib stops to verify that stops do not engage pins in boom top.

CAUTION**Jib Stop Damage!**

Do not luff down if jib stops will engage pins in boom top. Jib stops can be damaged.

14. Jib straps will slacken as boom and jib lower (View D).
Signal person, watch jib straps along left side of jib as boom and jib are lowered. Do not allow straps to become too slack or they will bounce against jib inserts. Signal operator to haul in luffing hoist wire rope (luff up) so jib straps remain 2-1/2 – 3-1/2 ft (0,76 – 1,07 m) above strap supports at end of jib top. ***Do not allow jib straps to go into tension.***

It will be necessary to use limit bypass switch to luff down if BLOCK UP limit is on.

**WARNING****Tipping Hazard!**

Do not allow jib straps to become too tight during lowering steps. Crane will tip or structural damage will result.

Do not allow jib straps to become too slack during lowering steps. Strap connectors will bounce against jib inserts, possibly resulting in damage.

15. Continue to boom down approximate boom to luffing jib angle shown in View D and stop boomerang down and luffing up.
Luff up or down as required to position jib straps 2-1/2 – 3-1/2 ft (0,76 – 1,07 m) above strap supports at end of jib top.

16. Boom down until connectors between jib butt and first jib insert are approximately 6 in (150 mm) from ground.
17. Make sure jib straps lower into strap supports at ends of inserts.
18. Signal crane operator to extend cylinders with the mode switch. Cylinders will extend (View F) and remain extended.

Removing #79A Jib**Remove Jib Load Line**

Jib load line will be used to lower main strut later in the removal procedure. Haul in load line on Drum 3 until end of line is near boom hoist equalizer.

Remove Jib Dolly

Reverse installation steps to remove jib dolly (Figure 4-27). *Do not lower jib onto ground.*

Remove Upper Jib Point

1. Support upper point with fork-lift truck.
2. Remove connecting pins (7, Figure 4-27, View E)
3. Lower jib onto blocking approximately 6 in (150 mm) high.

Boom down as required so jib sections are parallel to ground.

Remove Jib

Jib removal is identical to boom removal. The following instructions assume that assembly personnel already know how to disassemble the boom (jib) sections. If in doubt, see Boom Rigging Guide in Crane Operator's Manual

**WARNING****Tipping Hazard!
Crushing Injury Hazard!**

Jib sections can collapse when connecting pins are removed.

Block both ends of each jib insert before removing connecting pins.

Never work under or inside jib sections that are not securely blocked.

Disassemble Jib

NOTE: Do not disassemble butt and first two inserts at this time.

1. Remove jib top and all but two inserts next to jib butt.
2. Disconnect jib straps. Store links as shown in Figure 4-21, View J.
3. Store straps on jib sections.

4. Remove wind speed indicator from jib top to prevent damage during shipping.
- Disconnect electrical cable at base of wind speed.
 - Remove nuts, star washers, and bolts from base of wind speed mounting bracket.
 - Store indicator assembly in a safe place on crane.

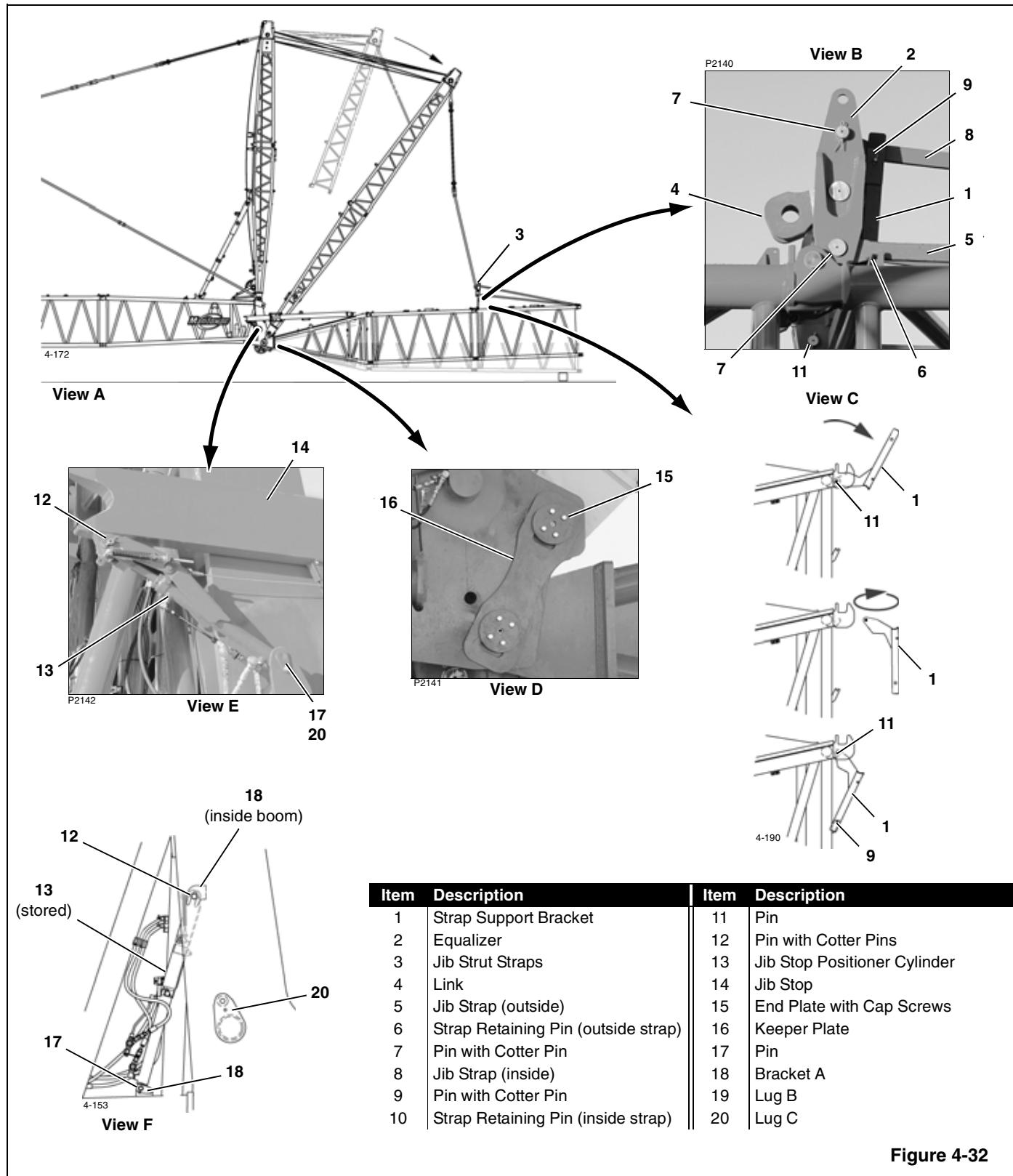


Figure 4-32

Remove Jib Strap Equalizers

See Figure 4-32 for following procedure.

1. Luff down to lower jib strut (View A).
2. Guide strut strap equalizers (2, View B) into strap support brackets (1) as jib strut is lowered.
3. Disconnect jib strut straps (3, View A) from equalizer links (4, View B). **Strut straps will swing to rear.**
Store connecting pins in holes of jib strut straps (3).
4. Support outside jib strap (5, View B) with assist crane and remove connecting pin (7) from strap bracket.
5. Remove strap retaining pin (6).
6. Lower strap (5) into outside strap bracket. Store strap in bracket with retaining pin (6).
7. Support inside jib strap (8) and remove connecting pin (7).
8. Set strap on pin (9) in strap support bracket (1).
9. Remove equalizer (2).
10. Rotate strap bracket forward (View C).
11. Lower inside strap (8) into inside strap bracket.
12. Store strap support brackets (1, View C):
 - a. Remove connecting pin (11).
 - b. Rotate support bracket (1) 180°.
 - c. Repin bracket (1) to jib butt with pin (11) and pin to storage lug with pin (9).
13. Remove strap retaining pin (10, View C) and store support bracket.
14. Store inside strap (8) in inside strap bracket with retaining pin (10).
15. Store connecting pins (7) in holes on jib straps.
16. Store strap support bracket on jib butt.

Remove Butt and First Two inserts

See Figure 4-32 for following procedure.

1. Raise jib strut to approximately 70°.
2. Store jib stop positioner cylinders (View F):

NOTE: Disconnecting hydraulic hoses is not necessary.

 - a. Support cylinder (13) to prevent its dropping when pins are removed.
 - b. Remove pin (12) from lug on jib stop and store in clevis on positioner top.
 - c. Remove pin (17, View E) from lug (20).
 - d. Rotate positioner so pin (12) slides into bracket (18, View F).
 - e. Using pin (17), connect bottom of positioner to lug (18) as shown in View F.
3. Using nylon slings from assist crane, hook onto butt and first two inserts. Wrap slings around chords only. *Do not use lifting lugs on butt or inserts and do not lift against lacings.*
4. Remove end plates (15, View D), keeper plates (16) and pins connecting jib butt to boom top. Store pins and keeper plates in boom top holes after butt and inserts are removed.
5. Remove jib butt and inserts. Guide jib butt as required so jib stops do not hit lacings.
6. Disassemble inserts from butt, if desired.

Lower Jib Strut

1. Slowly luff down to lower luffing jib.
2. As luffing jib is lowered, disconnect links (4), spreaders (7, 8), and jib straps (6) from jib strut (Figure 4-26, Views B and C).
Do not remove links (1)
3. Lower jib strut onto blocking approximately 3 ft (0,9 m) high.
Place blocking at front of butt just behind connecting pins.
4. Store links as shown in Figure 4-26, View D.

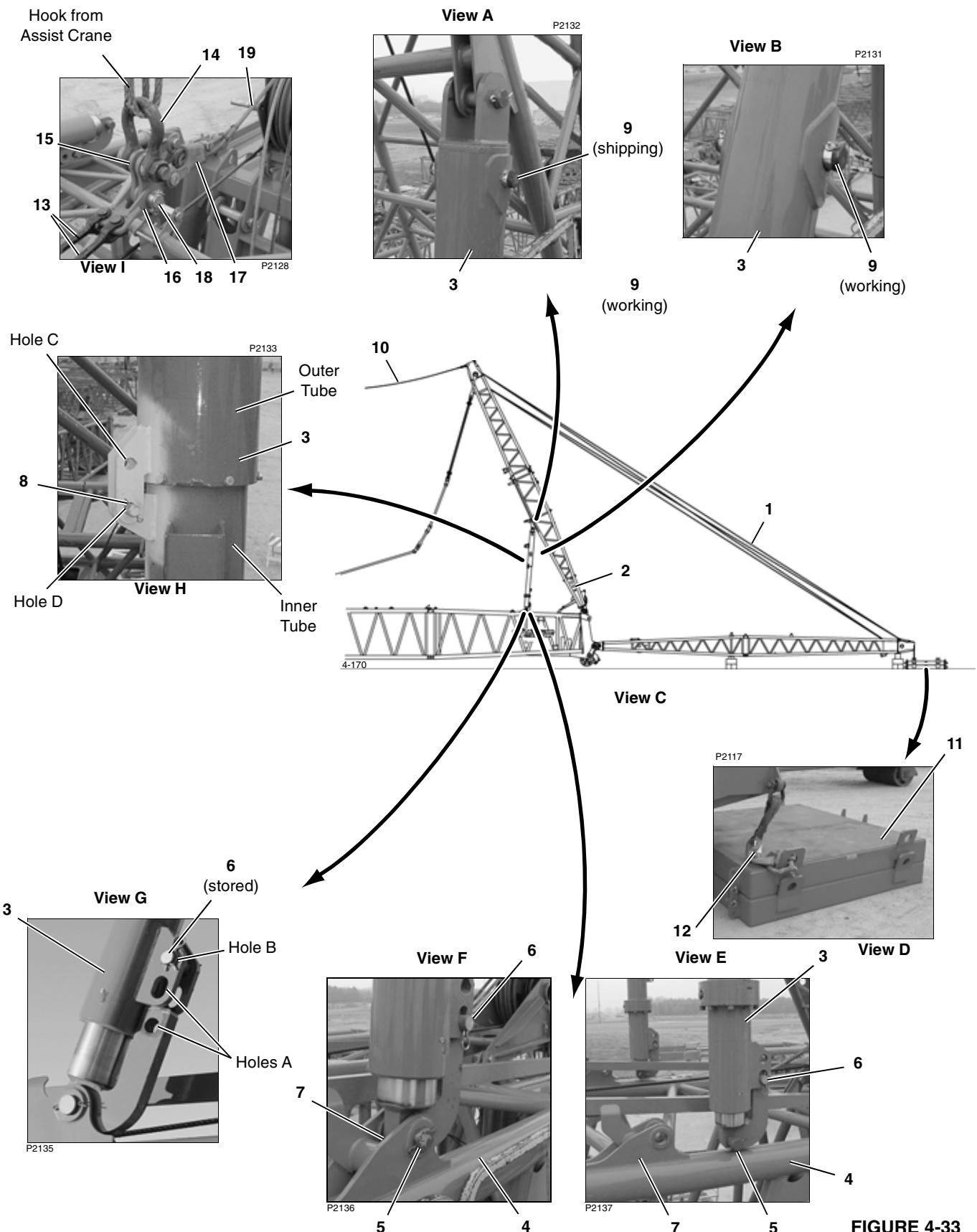


FIGURE 4-33

Lower Main Strut

See Figure 4-33 for following procedure steps.

1. Anchor end of jib strut to counterweight:

- a. Remove one top crane counterweight box from each side of crane counterweight.
Boxes must be equipped with tie link lugs.
- b. Stack counterweight boxes (11, View D), one at a time, at jib strut top.
- c. Secure lifting lugs on top counterweight box (11) to lugs on jib strut top with shackles and suitable slings (12, View D). Minimum capacity required for slings is 25,000 lb (11 340 kg) per side.
- d. Connect counterweight boxes with tie links as shown in Figure 4-21, View G (four places).

**WARNING****Falling Strut Hazard!**

Do not disconnect crane counterweight (11) from jib strut until all remaining steps are performed. Counterweight is required to prevent jib strut from rising when main strut is lowered.

If counterweight is not connected to jib strut, jib strut will rise part way and then both struts could fall forward violently.

2. Luff down until luffing hoist wire rope is slack.
3. Unpin handling pendants and links from lugs on main strut butt.
4. Attach 55 USt (50 t) shackle (14, View I) and hook from assist crane to links (15).
5. Connect Drum 3 load line (19, View I) to link (16) with load line socket (17).

- Use same socket used to anchor load line to boom or jib point.
- Make sure Drum 3 load line passes under Drum 3 guide sheave in mast.
- Make sure Drum 3 load line passes through center of boom hoist wire rope and over top of boom hoist equalizer.

6. Pin strut handling pendants (10, View I) to link (16).

7. Slowly pull main strut back until Holes A in strut stop are aligned.

CAUTION**Strut Damage!**

Pull strut back only until holes are aligned. Pulling strut further back may damage strut to strut stops.

8. Remove pin (6) from Hole B and insert in Hole A so cylinders cannot extend (View E).
9. Pay out Drum 3 load line so line is slack.
10. Luff up as needed to remove load from pins (9, View B).
11. Remove pins (9, View B) from lower holes and store in upper holes (View A).
12. Luff down to retract strut stop tubes.
13. Remove tube retaining pins (8, View G) from Hole A and insert in Hole B.
14. Luff up slightly to remove load from strut stop pins (5, View F).
15. Remove pins (5) and luff up until stops can be swung to strut (View E).

Continued on Next Page

Component Identification for Figure 4-33

Item	Description	Item	Description
1	Luffing Hoist Line (Drum 6)	11	Crane Counterweight Boxes
2	Main Strut	12	Sling and Shackle
3	Strut Stop	13	Retaining Pin with Cotter Pins
4	Boom Top	14	Shackle (user-supplied)
5	Pin with Cotter Pins	15	Links
6	Cylinder Rod Retaining Pin	16	Link
7	Lug	17	Socket
8	Tube Retaining Pin	18	Pin with Cotter Pin
9	Strut Locking Pin	19	Drum 3 Load Line
10	Handling Pendants		

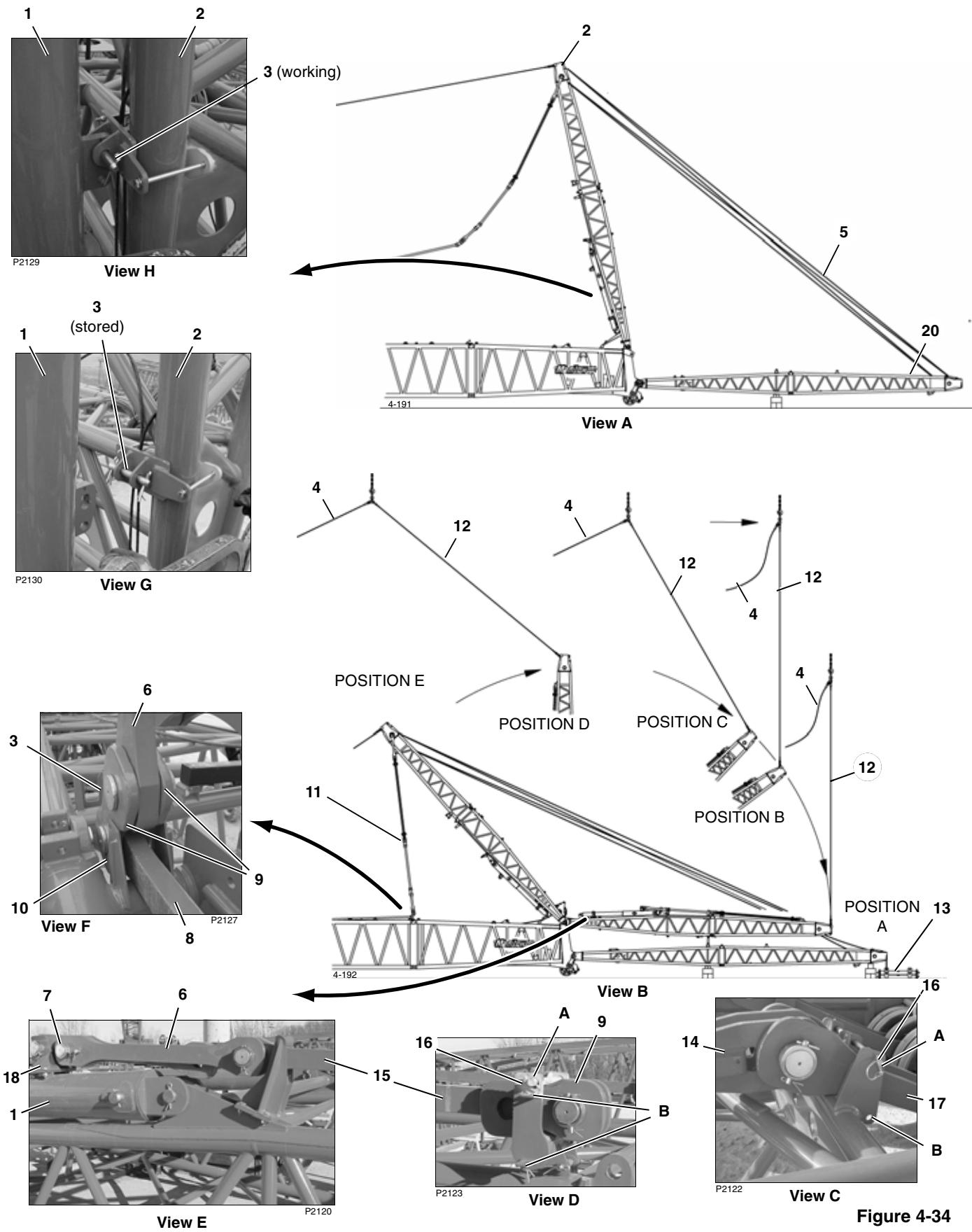


Figure 4-34



Lower Main Strut (continued)

See Figure 4-34 for following procedure steps.

16. Remove retaining pins (3, View G) from lugs on main strut (2).
17. Pin strut stops (1) to main strut (View H).
18. Luff down to lower main strut until strut backstay straps (11) can be disconnected (POSITION E, View B). Guide boom backstay straps (8) into strap brackets (10, View F) on boom.
19. Remove pins (7, View F) to disconnect adjustable links (6) from connecting links (9) and boom backstay straps (8). Store pins (7) in adjustable link (6). Store links (9) with boom backstay straps (8).
20. Disconnect rear tie links on counterweight boxes (13) as shown in Figure 4-21, View E.
21. Raise strut handling pendants (12) with assist crane so links and hook from assist crane are slightly higher than top of main strut.
Pay out Drum 3 load line while raising pendants
22. Slowly luff up to raise main strut while paying out Drum 3 load line and following with assist crane.

Do not induce any side load in main strut with assist crane. Load line from assist crane should remain vertical during strut lowering procedure.

CAUTION
Overload Hazard!

Do not allow crane counterweight (13) to rise off ground at any time during strut lowering procedure. Load line and pendants could be overloaded, possibly resulting in damage.

23. As main strut nears vertical — POSITION D — tighten pendants (12) and Drum 3 load line (4) so main strut moves forward smoothly past vertical without dropping (View B).
24. Continue to luff up while following with assist crane — pay out load line and travel — until main strut is at approximately 45° (POSITION C).
25. Slacken Drum 3 load line (4) and raise pendants (12) to vertical — POSITION B — while luffing up.
26. Continue to lower main strut with assist crane while luffing up until main strut comes to rest on jib strut — POSITION A. Guide strut straps into strap brackets as strut comes to rest on jib strut.
Allow luffing hoist wire rope (5) to slacken as strut is lowered, but do not allow wire rope to kink or jump off sheaves.
27. Lower pendants (10, Figure 4-25, View I) and links (15, Figure 4-25, View I) to storage position on main strut butt. Unpin socket (17) from link (16) and pins links (15) to main strut butt.
28. Remove counterweight (11) from end of jib strut, one at a time.
29. Disconnect strut top straps (14) from strut butt straps (15). Store connecting pins in holes on strut top straps.
30. Rotate connecting links (9, View D) to stored position. Remove strap shipping pins (16) from holes B and install in holes A as shown in View D.
31. Remove strap shipping pins (16, View C) from holes A and install in holes B to secure strut straps to main strut top.
32. Pin adjustable links (6) to brackets (18) with connecting pin (7) as shown in View E. If necessary, adjust link (6) to shorter length (Figure 4-21, View M) before pinning.

Component Identification for Figure 4-34

Item	Description	Item	Description
1	Strut Stop	10	Strap Bracket
2	Main Strut	11	Strut Backstay Straps
3	Pin with Cotter Pins	12	Strut Handling Pendants
4	Drum 3 Load Line	13	Counterweight
5	Luffing Hoist Line	14	Backstay Strap (strut top)
6	Adjustable Link	15	Backstay Strap (strut butt)
7	Pin with Collar and Retaining Pins	16	Strap Shipping Pin
8	Boom Backstay Strap	17	Link
9	Connecting Links	18	Strap Bracket

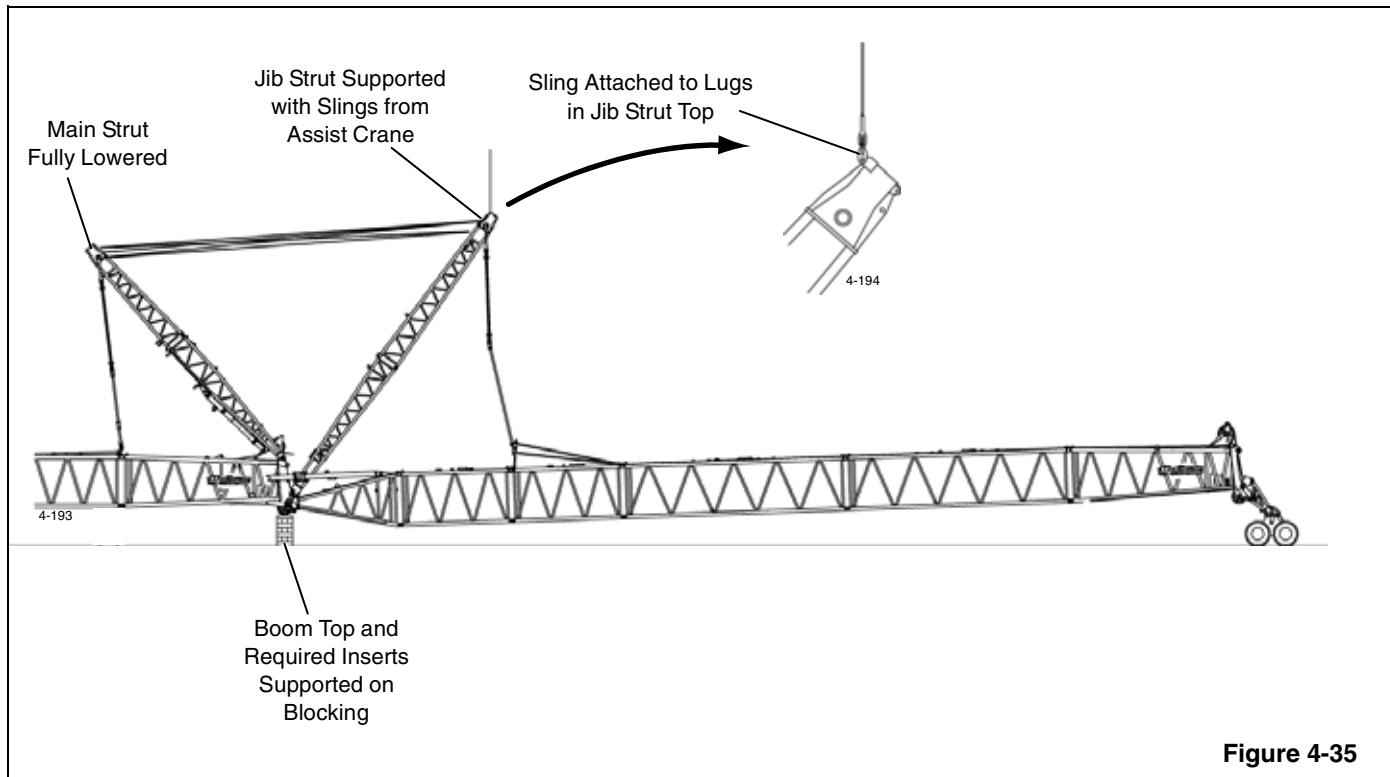


Figure 4-35

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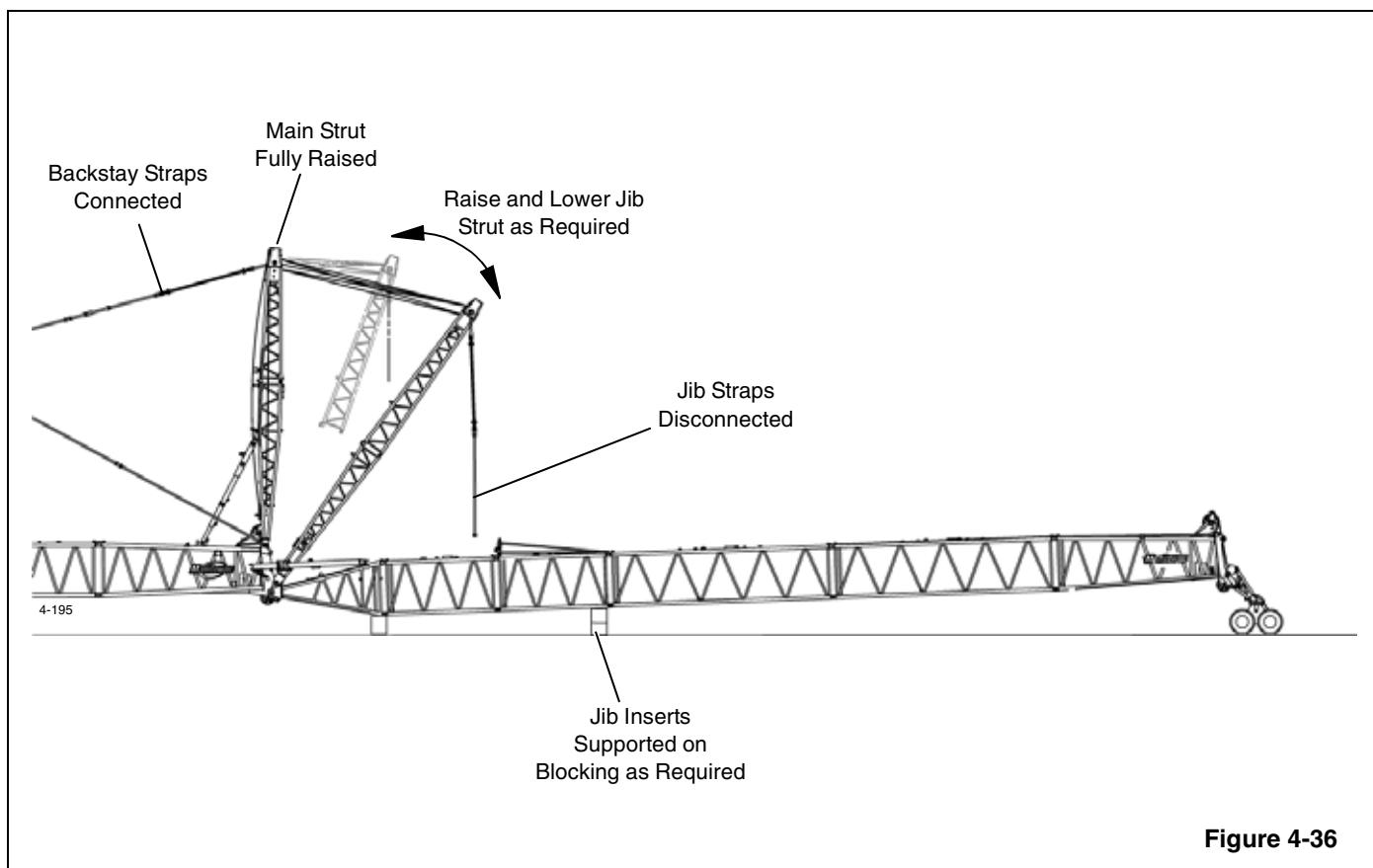


Figure 4-36

Store Main Strut Top

See Figure 4-21 for following procedure.

1. Support main strut top (3, View A) with slings from assist crane.
2. Remove bottom and top pins (Figure 4-20, View H) connecting strut top to strut butt.
3. Move strut top slowly forward while hauling in luffing hoist wire rope so that wire rope between struts pays out smoothly without kinking or binding.
4. Rotate strut supports C (5, View D) to working position (View C) and pin main strut top to jib strut top with shipping pins (6).
5. Lower butt end of main strut top and pin to jib strut top with pins (7, View A).

Store Luffing Hoist Wire Rope

1. Disconnect wire rope from socket (20, Figure 4-20, View G) in end of main strut. Store socket with main strut.
2. Spool luffing hoist wire rope onto Drum 3 for storage.

If desired, a "sucker line" can be attached to end of luffing hoist wire rope and spooled through sheaves in struts as luffing hoist wire rope is removed. This practice will make it easier to install the luffing hoist wire rope next time.

Remove Main and Jib Strut Tops

Main strut top and jib strut top are shipped together as shown in Figure 4-20, View H.

Reverse assembly steps under **Install Jib Strut Top** topic to remove strut tops.

Remove Jib and Main Strut Butts

Main strut butt and jib strut butt are shipped together as shown in Figure 4-20, View A.

Reverse assembly steps under **Install Jib and Main Strut Butts** topic to remove strut butts.

Changing Boom and Jib Length



DANGER

Crushing Injury Hazard!

Boom and jib sections can collapse when connecting pins are removed.

- Block or support ends of boom and jib sections with slings from an assist crane before removing connecting pins.
- Never work under or inside boom or sections that are not securely blocked or supported with slings from an assist crane.

Boom

See Figure 4-35 for following procedure.

To prevent parts from collapsing and possible death or serious injury to personnel, observe following safety precautions when changing boom length:

- Know weight of what you are lifting and size assist crane and all lifting slings accordingly.
- Lower and pin boom hoist equalizer to rails on boom insert. **Do not disconnect boom straps until this step is performed. Equalizer could slide off rails.**
- Lower main strut fully. Perform **Lower Main Strut** steps 2–18.
- Connect slings from assist crane to both sides of jib strut and hoist so slings are just taut. **Do not disconnect backstay straps until this step is performed.**
- Do not attempt to handle boom with equalizer pinned to rails. **Structural failure will result and boom will fall.**

Handle boom only with nylon slings securely attached to chords as close to end of inserts as possible. **Do not lift against lacings or lifting lugs on inserts.**

- Do not cantilever more than 40 ft (12,2 m) of insert from end of inserts being lifted. Attach nylon slings to both inserts as shown in Figure 4-37.

Do not disconnect assist crane from jib strut until all of following steps are performed:

- Boom length changed.
- Boom straps connected to boom hoist equalizer and equalizer unpinned from rails.
- Backstay straps pinned to main strut.
- Main strut fully raised. Perform **Raise Main Strut** steps 16–28.

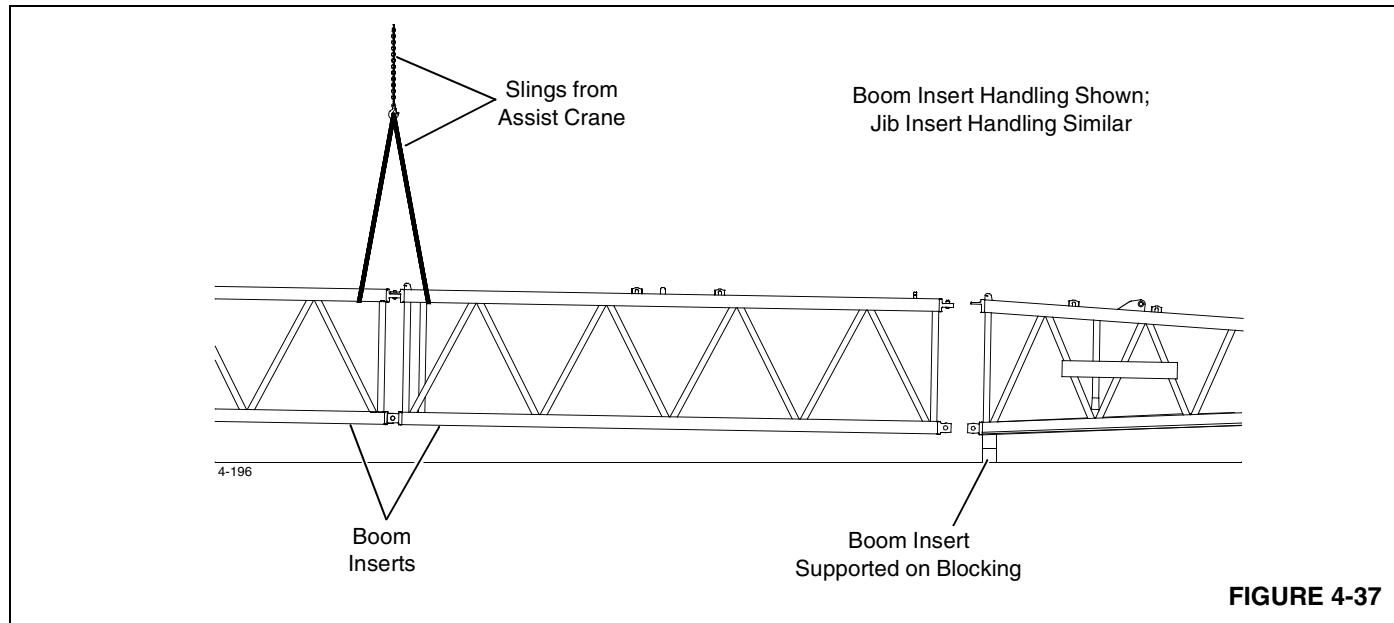
Jib

See Figure 4-36 for following procedure.

It is okay to change the jib length with the struts positioned, as follows:

- Main strut fully raised. Do not disconnect backstay pendants.
- Jib straps disconnected from jib strut straps.
- Jib strut raised and lowered as required to provide clearance. ***Do not raise strut above 70° or lower strut to point that it contacts jib butt.***

- To prevent parts from collapsing and possible death or serious injury to personnel, observe following safety precautions when changing jib length:
- Know weight of what you are lifting and size assist crane and all lifting slings accordingly.
- Handle jib only with nylon slings securely attached to chords as close to end of inserts as possible. ***Do not lift against lacings or lifting lugs on inserts.***
- Do not cantilever more than 40 ft (12,2 m) of insert from end of inserts being lifted. Attach nylon slings to both inserts as shown in Figure 4-37.



WIRE ROPE INSTALLATION

NOTE: Wire rope installation instructions from various Original Equipment Manufacturers (OEM) are provided at the end of this section. If a conflict exists between the following instructions and the OEM instructions, the OEM instructions apply.

Wire Rope Storage

Store wire rope in coils or on reels off the ground or floor in a clean and dry indoor location. If outdoor storage is necessary, the wire rope must be covered with a protective wrapper. Keep the wire rope away from acids, fumes, and other corrosives. Keep the wire rope away from heat that can dry out the lubricant. If the storage period will be long, lubricate the wire rope and perform periodic inspection given in this section at least monthly.

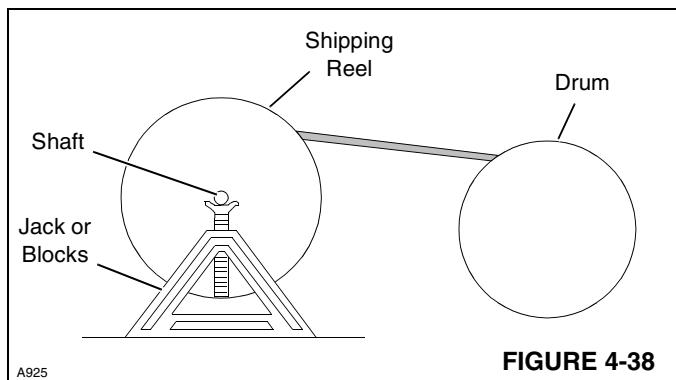
Removing Wire Rope from Shipping Reel

CAUTION!

Wire Rope Damage!

Shipping reel must rotate when wire rope is unwound. Attempting to remove wire rope from a stationary reel can result in a "kinked" wire rope, and wire rope will be ruined.

1. Mount wire rope shipping reel on a shaft supported at both ends by jacks or blocks as shown in Figure 4-38.



2. Provide a brake at shipping reel (see Figure 4-39) so wire rope can be wound tightly onto drum.

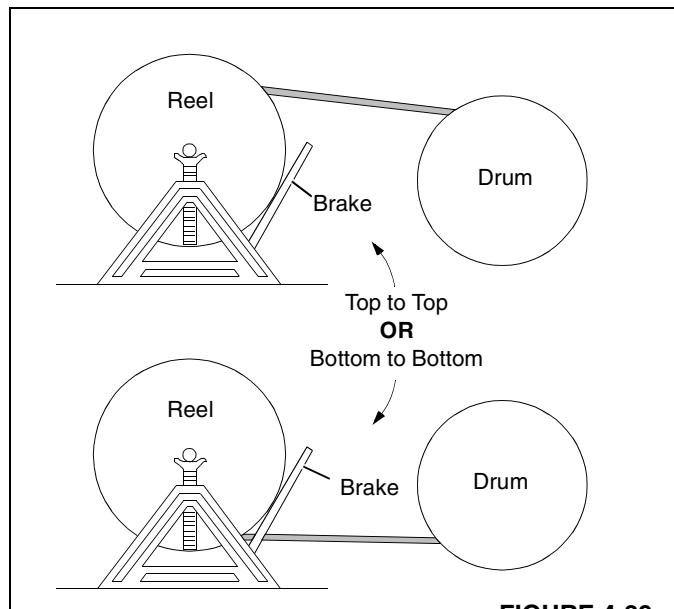


FIGURE 4-39

3. Avoid a reverse bend when winding wire rope onto drum: wind from top of reel to top of drum or from bottom of reel to bottom of drum as shown in Figure 4-39.
4. Avoid dragging wire rope in dirt or around objects that can scrape, nick, cut, or crush wire rope.

Seizing and Cutting Wire Rope

Apply tight seizures of annealed wire to the ends of all wire rope. If not done, the rope wires and strands may slacken. This action will result in overloading of some strands and underloading of others. Bird caging and breakage of the wire rope can occur.

Before cutting wire rope, apply seizures on both sides of the point where the cut will be made. Then cut the wire rope with a torch, rope cutter, or abrasive cut-off wheel.

See Figure 4-40 for:

- Number of seizures to be applied to the ends of wire rope and to both sides of the point where a cut will be made.
- Proper application method. Each seizing should be one rope diameter long.

A925

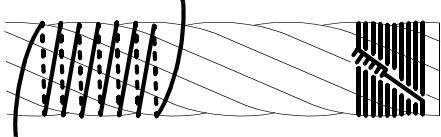
Wire Rope Type	Seizings Required
Preformed	1
Non-preformed	2
22 mm Diameter or Smaller	
Non-preformed	3
26 mm Diameter or Larger	

Place free end of seizing wire in valley between two stands. Then wind seizing wire over free end as shown. Finally, twist and pull two ends of seizing wire together until seizing is tight.



View A Rope Diameter 1 in (26 mm) and Larger

Wind seizing wire around wire rope as shown. Then twist two ends of seizing wire together at center of seizing. Alternately twist and pull ends until seizing is tight.



View B Rope Diameter Smaller than 1 in (26 mm)

FIGURE 4-40

Anchoring Wire Rope to Drum

See Figure 4-41 for following procedure.

Use the correct wedge part number for the size of wire rope being used; see parts drawing for the boom hoist drums or for the load drum shaft to obtain the correct part number.

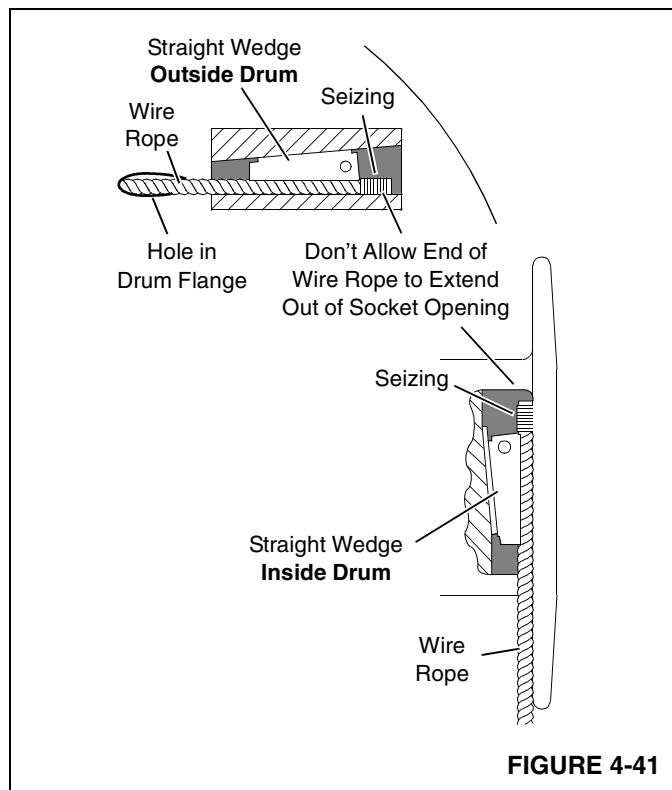
1. Assemble wire rope and wedge to drum socket.
2. Tighten wedge, rapping back of wedge with a brass drift pin and hammer.



Falling Load Hazard!

Wire rope can be pulled out of drum if following steps are not taken.

- Install straight wedge so corrugated side is against wire rope.
- Install wedge so end of wire rope extends past end of wedge, but not out of drum socket.
- Make sure seizing is not under wedge. Remove seizing if it interferes with assembly.



Winding Wire Rope onto Drum

See Drum and Lagging Chart in Capacity Chart Manual for correct size of drum laggings, if used.

See Wire Rope Specifications Chart in Capacity Chart Manual for correct type, size, and amount of wire rope to be installed on load drums.

See Boom Rigging Drawing at end of this section for correct type, size, and amount of wire rope to be installed on boom hoist drums.

1. Carefully inspect drums and all rope guides, rollers, and sheaves for wear or damage that can cause wire rope to wear or be cut. If defects cannot be fixed, replace faulty parts.
2. Apply tension to wire rope as it is wound slowly onto drum.

First wrap must be tight against drum flange for approximately three-fourths of drum diameter (see Figure 4-42).

3. Tap adjacent wraps against each other with a soft metal or wooden mallet.

Use extreme care not to put twists or turns in wire rope; allow rope to assume its natural lay.

CAUTION! Wire Rope Damage!

Voids or spaced wraps in first layer (Figure 4-42, View B) will permit movement and a wedging action with subsequent layers. Wedging action will cause crushing and abrasion of wire rope.

Never allow wire rope to "cross wind" on drums.

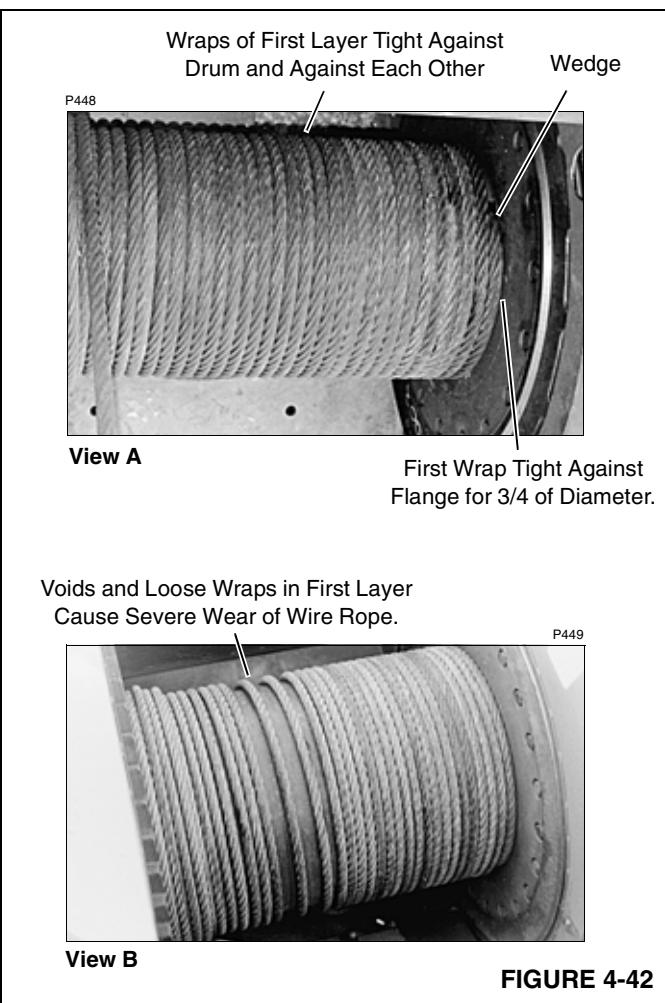


FIGURE 4-42

Anchoring Wire Rope to Wedge Socket



WARNING

Falling Load Hazard!

- Inspect all parts prior to use. Do not use parts that are cracked or otherwise defective.
- Remove minor nicks, burrs, or rough edges from socket, wedge, or pin by lightly grinding. Do not reduce original dimensions by more than 10%.
- Do not reinstall shipping material (bolt, plastic strap or wire) in hole of wedge or socket after assembling. Discard these materials because they can prevent wedge from tightening in socket.
- Only use a wedge and socket which are correct size for wire rope being used. Do not mix and match parts from one assembly with parts from another assembly.
Terminator™ wedge has "go" and "no-go" holes to check for proper rope size.
- Attach wire rope clip to dead end of wire rope after assembling wire rope to wedge and socket.
- If dead end of wire rope is welded, seize end of wire rope and cut off weld before assembling to wedge and socket. Weld will not allow strands of wire rope to adjust around bend of wedge, resulting in high strands and wavy rope. This condition can seriously weaken attachment.

See Figure 4-44 for following procedure.

1. Assemble wire rope and wedge to socket so live end of wire rope is in a straight line with socket pin hole. *Do not assemble WRONG as shown.*
2. Allow dead end of wire rope to extend past end of socket amount shown.
3. Allow wire rope to assume its natural lay.
4. Pull against wedge and live end of wire rope enough to tighten wedge in socket.
Use a brass hammer to seat wedge and wire rope as deep into socket as possible.
5. Attach a wire rope clip to dead end of wire rope using one of the RIGHT methods shown. Rope clip will aid in preventing wire rope from being pulled out of socket.

NOTE: Use Right Method A only if wire rope clip is small enough to be securely tightened to dead end. Right Method C is only for a Terminator™ wedge socket

6. After socket is pinned in place, hoist load slowly so wedge seats tight. *Do not shock load socket and wedge.*



WARNING

Falling Load Hazard!

Wire rope can break if following precaution is not observed:

- Do not attach dead end of wire rope to live end of wire rope with wire rope clip. Wire rope clip will transfer load from live side of wire rope to dead end, seriously weakening attachment.

Anchoring Wire Rope to Button Socket

See Figure 4-43 for following procedure.

1. Remove pin from socket.
2. Install button end of load line in socket.
3. Pin socket to anchor point.
4. Securely tighten locking screw.

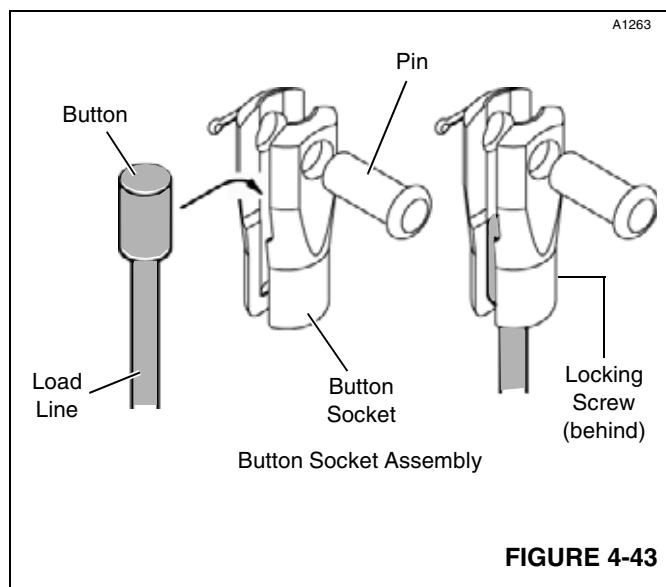


FIGURE 4-43

Wire Rope/Clip Size inch (mm)	0.875 (22,23)	1.0 (25,4)	1.125 (28,58)	1.25 (31,75)
Torque * ft/lbs (kN/m)	225 (0,30)	225 (0,30)	225 (0,30)	360 (0,49)

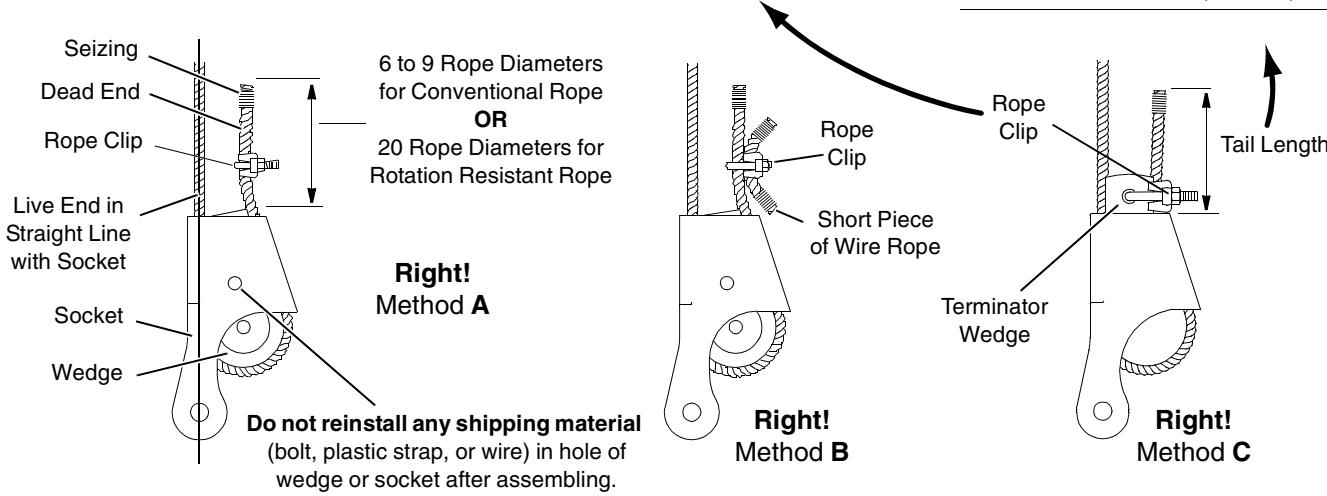
* Tightening torque values shown are based on threads being clean, dry and free of lubrication.

Standard 6 to 8 Strand Wire Rope

Minimum of 6 rope diameters, but not less than 6 in (152 mm).

Rotation Resistant Wire Rope

Minimum of 20 rope diameters, but not less than 6 in (152 mm).



ALL ARE DANGEROUS AND PROHIBITED!

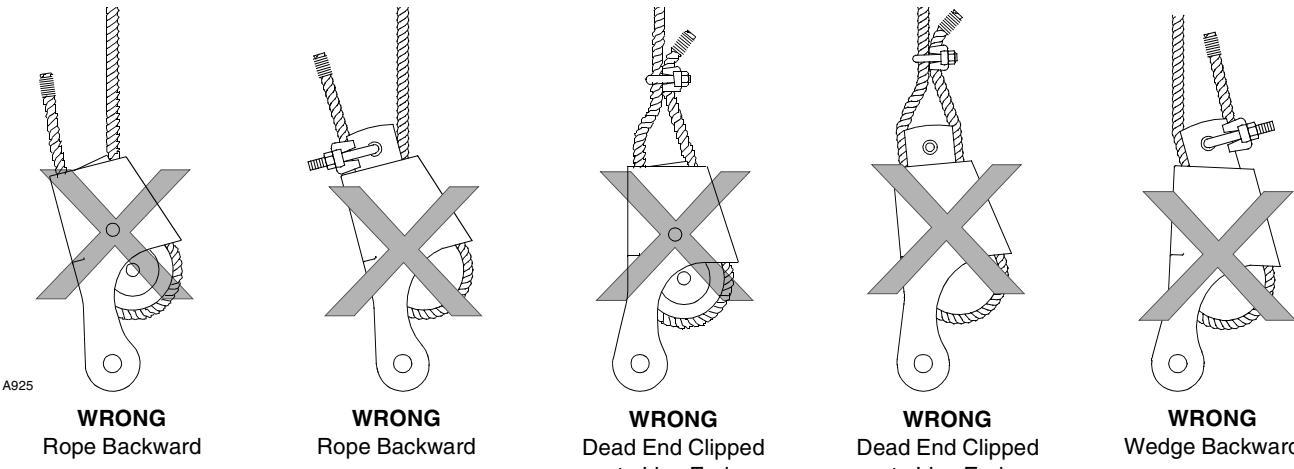


FIGURE 4-44

Breaking in Wire Rope

After installing a new wire rope, break it in by operating it several times under light load and at reduced speed. This practice allows the wire rope to form its natural lay and the strands to seat properly.

NOTE: Wire rope will stretch during the break-in period, reducing the wire rope's diameter as the strands compact around the core.

The dead wraps of wire rope on the drum can become slack during operation, even if the utmost care is used during installation of the wire rope. This slackening is caused by the normal stretch that occurs in a new wire rope under tension and periodically throughout the wire rope's life from release of the load.

When slackness is noted, tightly wind the dead wraps of wire rope onto the drum. If left uncorrected, a wedging action with subsequent layers will occur and the resultant abrasion may cause broken wires in the dead wraps.

PAD EYE USAGE FOR WIRE ROPE REEVING

See Figure 4-45 for following procedure.

General

Some rotation-resistant wire rope supplied by Manitowoc is equipped with a No. 1.5 pad eye welded to the leading end of the wire rope.

A sucker-line can be attached to the pad eye to make it easier to reeve the load block.

Safety

1. For No. 1.5 pad eye, do not exceed 4,45 kN single line pull.
2. Make sure sucker line and rope clips are rated for at least 4,45 kN line pull.

3. Inspect pad eye prior to each use. **Replace it if:**

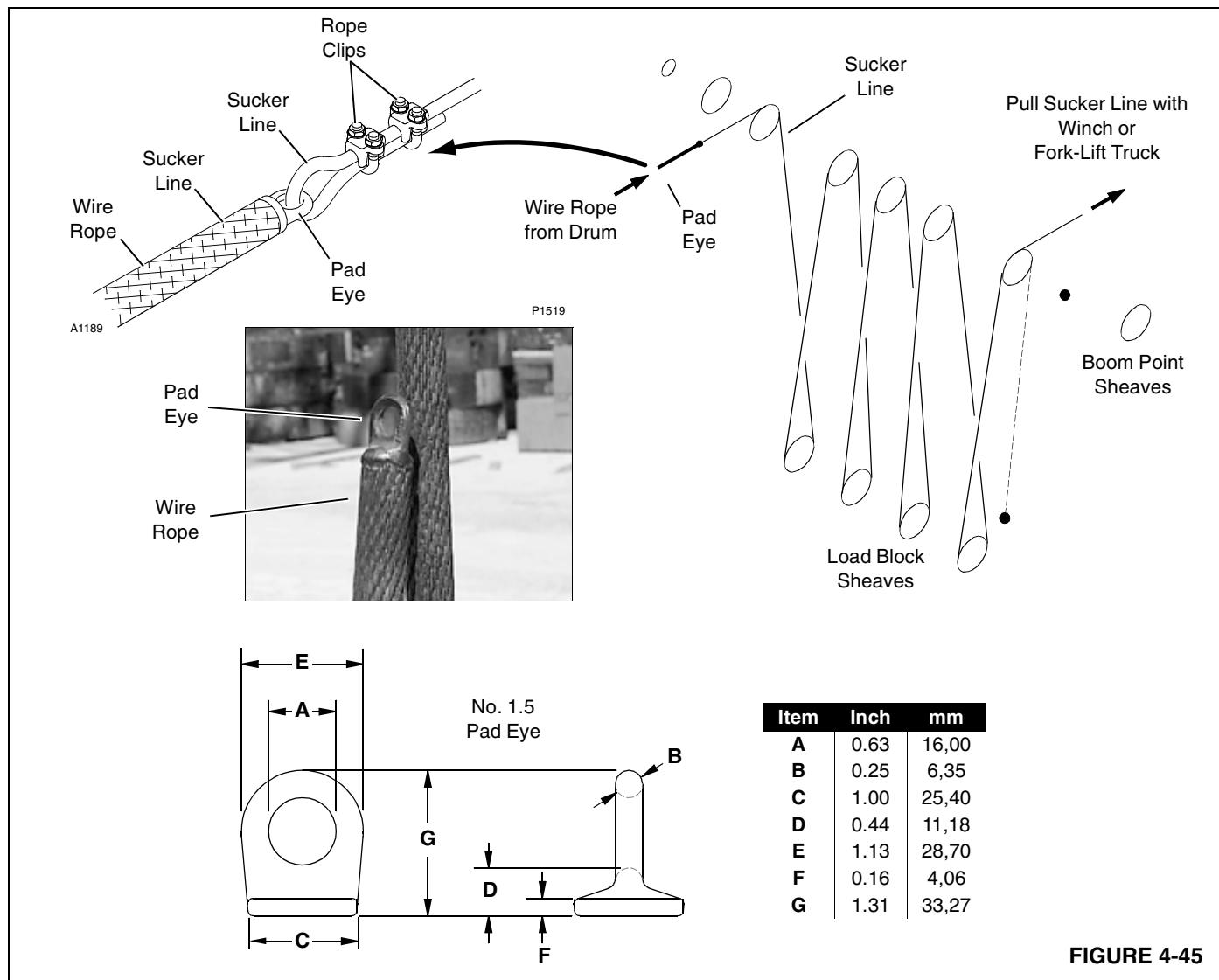
- Original dimensions have changed (Figure 4-45).
- Cracks or breaks exist in metal or weld.

WARNING

Flying Part Hazard!

Pad eye on end of wire rope has been provided **for reeving purposes only**. Any other use is neither intended nor approved.

Pad eye can break and fly apart with considerable force if it is overloaded, not used properly, or not maintained properly.



RIGGING WINCH OPERATION

If your crane is equipped with the optional rigging winch in the boom butt, see Rigging Winch Operation topic in the Operator's Manual for the crane. Also see drawing at the end of this section.

LOAD LINE REEVING - #44 LUFTING JIB

Load Blocks

See the Luffing Jib Assembly Drawings at the end of this section for a complete list of load blocks and weight balls available for this crane.



WARNING

Falling Load Hazard!

Use only a hook-and-weight ball or load block with a capacity equal to or greater than load to be handled.

Avoid overloading bearings in load block sheaves. Attach load to duplex hook so load hangs straight.

Load block can fail if overloaded, allowing load to fall.

Guide Sheaves

See Figure 4-47 and 4-48 for guide sheave identification and location of components in the lower and upper boom points.

Once the wire rope is routed through the guide sheaves, be sure to install rope guard pins, bars, and rollers to retain rope on guide sheaves. **Wire rope and sheaves can be damaged if rope is not properly retained on sheaves.**

Duplex Hook

Attach the load so it is balanced equally on the hook. Lifting slings must be within angles given in Figure 4-46 to achieve maximum hook capacity. The duplex hook has a hole to which an optional shackle can be attached as shown in Figure 4-46.



WARNING

Falling Load Hazard!

Limit load to be handled with shackle to capacity of load block or shackle, whichever is less.

Load block or shackle can fail if overloaded, allowing load to fall.

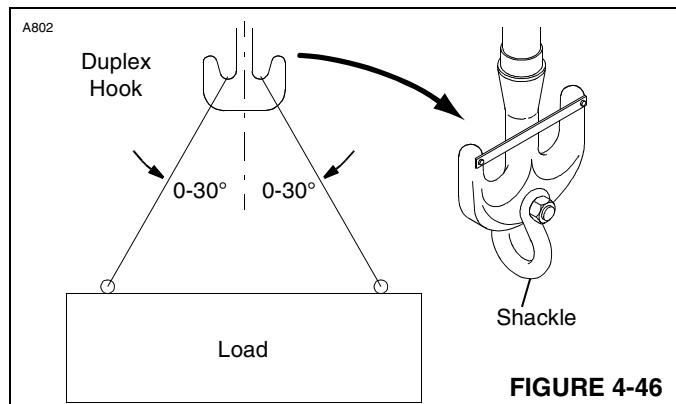


FIGURE 4-46

Wire Rope Specifications

See Wire Rope Specifications chart in Capacity Chart Manual for the following load block reeving information:

- Parts of line required to handle desired load.
- Wire rope length required for various boom/jib lengths and parts of line.
- Maximum spooling capacity of load hoists.

Wire Rope Installation

See Wire Rope Installation in this section for following instructions:

- Anchoring wire rope to drum.
- Installing wire rope on drum.
- Anchoring wire rope to wedge socket.

Reeving Diagrams

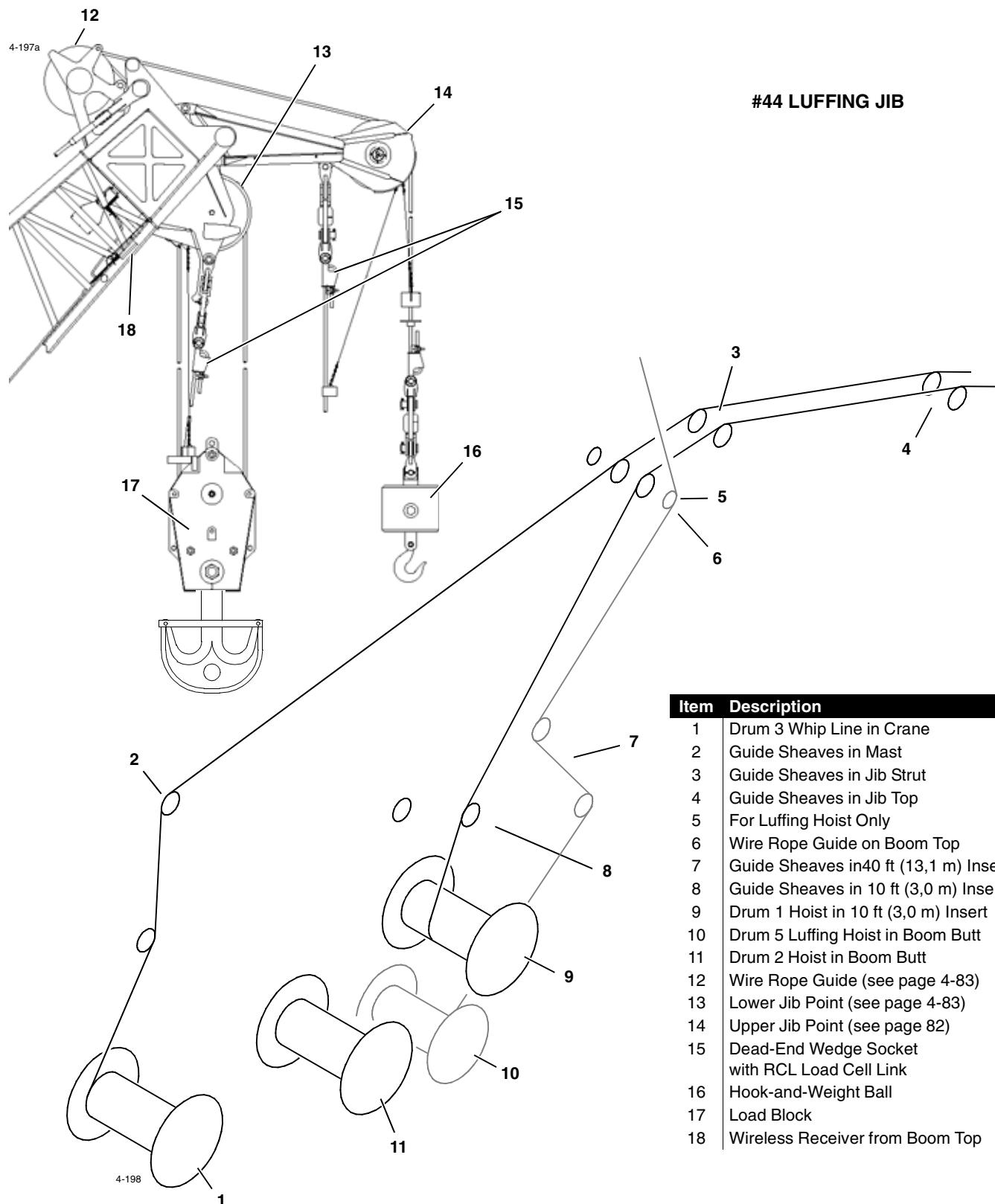
See Figure 4-49 for #44 Luffing Jib reeving diagrams.



WARNING

Avoid Death or Serious injury!

- Exercise care when block is standing in vertical position (Figure 4-50), as the potential for tipping exists. Potential causes of tipping are unstable work area, boom movement and the reeving process.
- If work area is unstable, lay block flat on side plate.



4

FIGURE 4-47

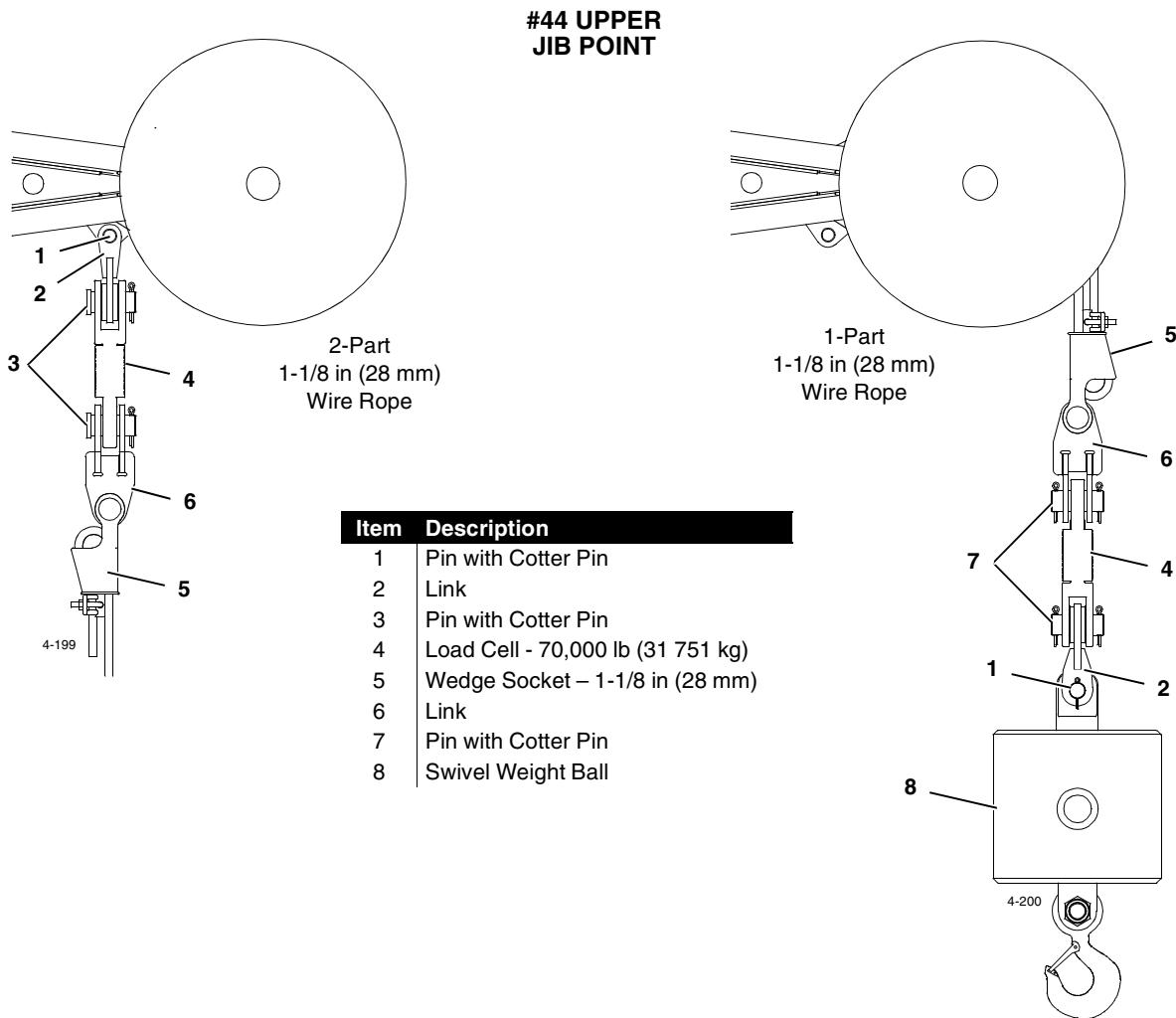
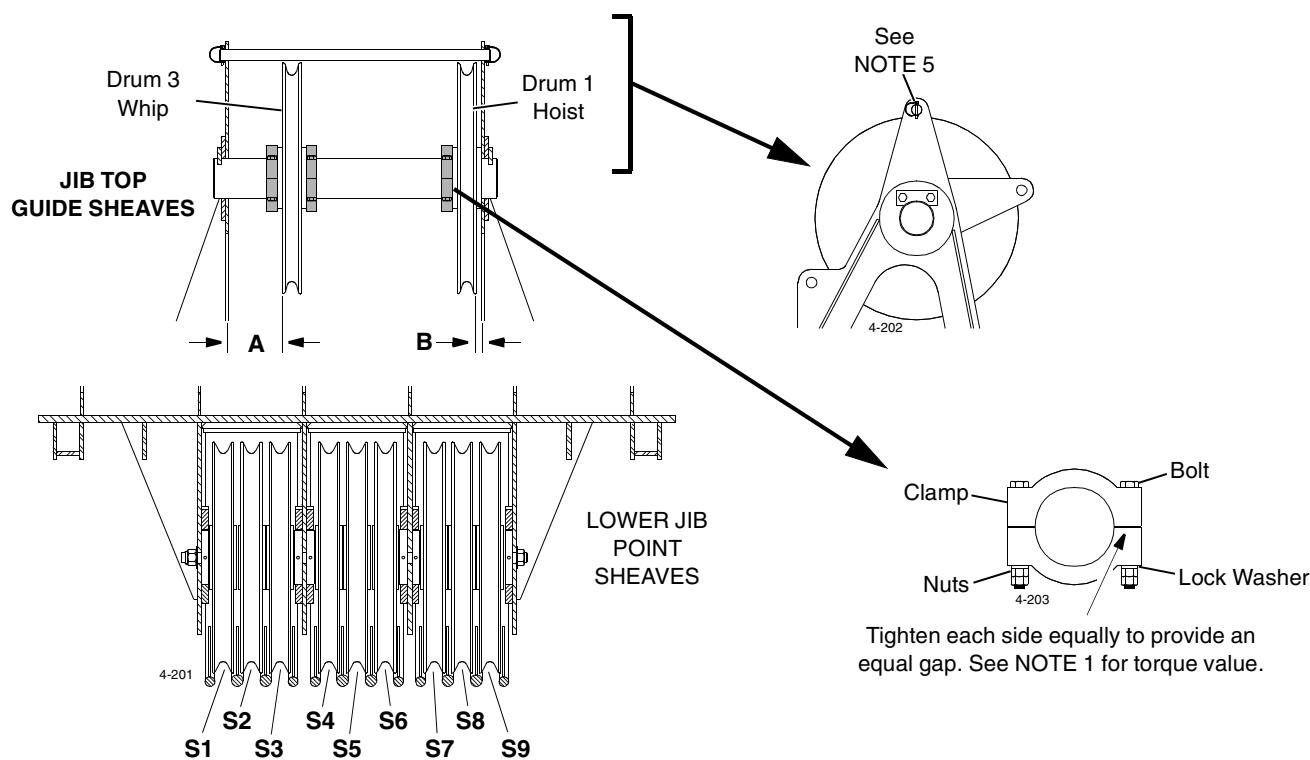


FIGURE 4-47 continued



#44 LOWER JIB POINT

Location of Guide Sheaves with Lead Line Going to Point Sheave Indicated

Drum 1	
Lead Line Routed to Sheave	Dimension B
S9	0.62 in (16 mm) NOTE 2
S8	2.06 in (52 mm) NOTE 3
S7	4.75 in (121 mm) NOTE 3
S6	10.44 in (265 mm) NOTE 3

Drum 3	
Lead Line Routed to Sheave	Dimension A
S4	10.69 in (272 mm) NOTES 3 & 4
S3	5.00 in (127 mm) NOTE 3
S2	2.06 in (52 mm) NOTE 3
S1	0.62 in (16 mm) NOTE 2

NOTE 1: Position clamps hand tight against sheave bearing. Before torquing bolts, check that sheave turns freely. Torque bolts lubricated with S.A.E. 20 oil to 120 ft-lb (163 Nm).

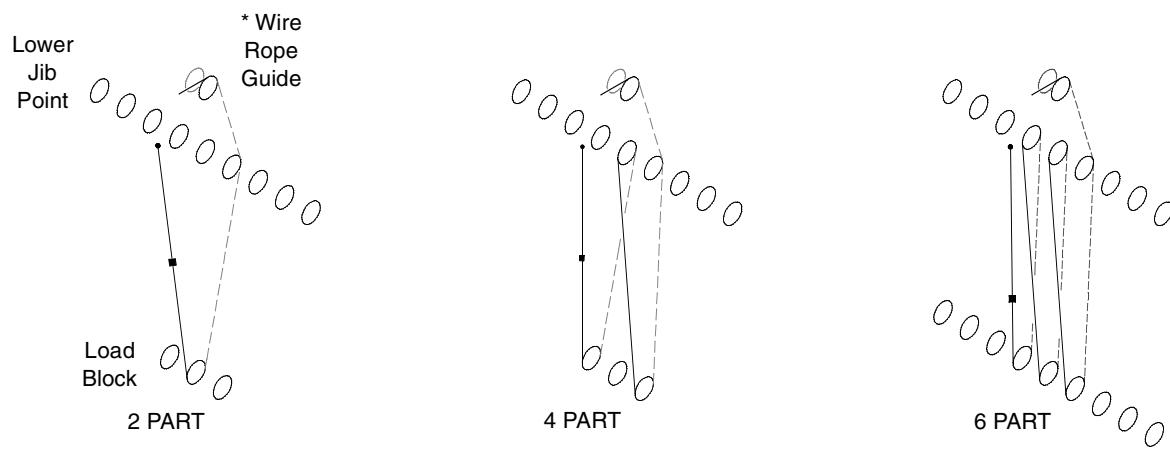
NOTE 2: This location requires sheave bearing to be snug against jib top side plate as shown at Dimension B.

NOTE 3: This location requires two clamps as shown at Dimension A.

NOTE 4: Position guide sheave at this location for whip line operation over upper jib point. Use two clamps.

NOTE 5: Install rope retaining pin in this hole.

FIGURE 4-48



#44 LUFTING JIB

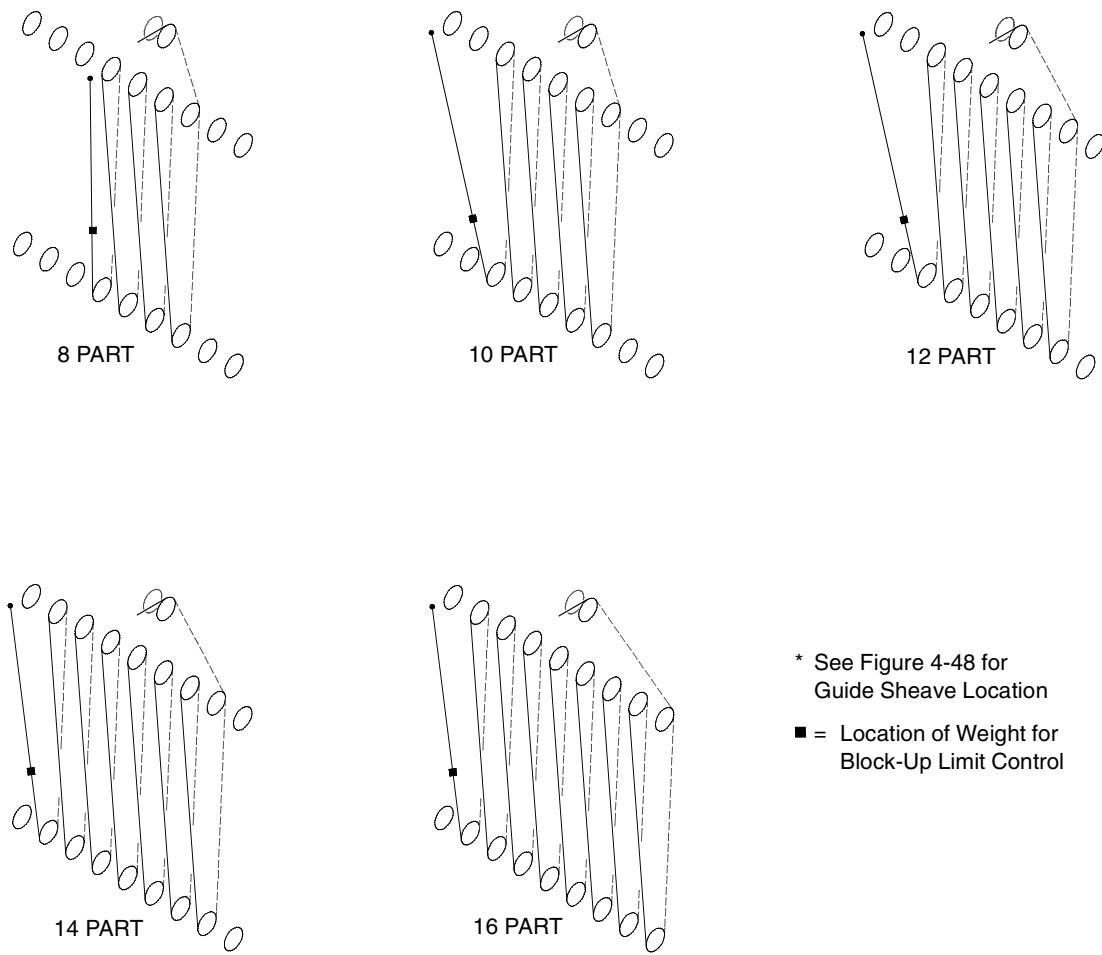


FIGURE 4-49

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4



LOAD LINE REEVING - #79A LUFTING JIB

Load Block Identification

See the Luffing Jib Assembly Drawings at the end of this section for a complete list of load blocks and weight balls available for this crane.



WARNING

Falling Load Hazard!

Use only a hook-and-weight ball or load block with a capacity equal to or greater than load to be handled.

Avoid overloading bearings in load block sheaves. Attach load to duplex hook so load hangs straight.

Load block can fail if overloaded, allowing load to fall.

Load Block Handling

Each load block has two lifting lugs as shown in Figure 4-50, View A.

The load blocks can be stood up for reeving as shown in Figure 4-50, View B.

Duplex Hook

Attach the load so it is balanced equally on the hook. Lifting slings must be within angles given in Figure 4-51 to achieve maximum hook capacity. The duplex hook has a hole to which an optional shackle can be attached as shown in Figure 4-51.



WARNING

Falling Load Hazard!

Limit load to be handled with shackle to capacity of load block or shackle, whichever is less.

Load block or shackle can fail if overloaded, allowing load to fall.

Wire Rope Specifications

See Wire Rope Specifications chart in Capacity Chart Manual for the following load block reeving information:

- Parts of line required to handle desired load.
- Wire rope length required for various boom lengths and parts of line.
- Maximum spooling capacity of load hoists.

Wire Rope Installation

See Wire Rope Installation in this section for instructions:

- Installing wire rope on drums.
- Anchoring wire rope to drums.

See Figure 4-52 and Figure 4-53 for dead-end locations and components in the lower and upper boom points.

Guide Sheaves and Drums

See Figure 4-54 for identification of the load drums and guide sheaves.

Once wire rope is routed through the guide sheaves, be sure to install rope guard pins, bars, and rollers to retain the wire rope on the sheaves. **Wire rope and sheaves can be damaged if rope is not properly retained on sheaves.**

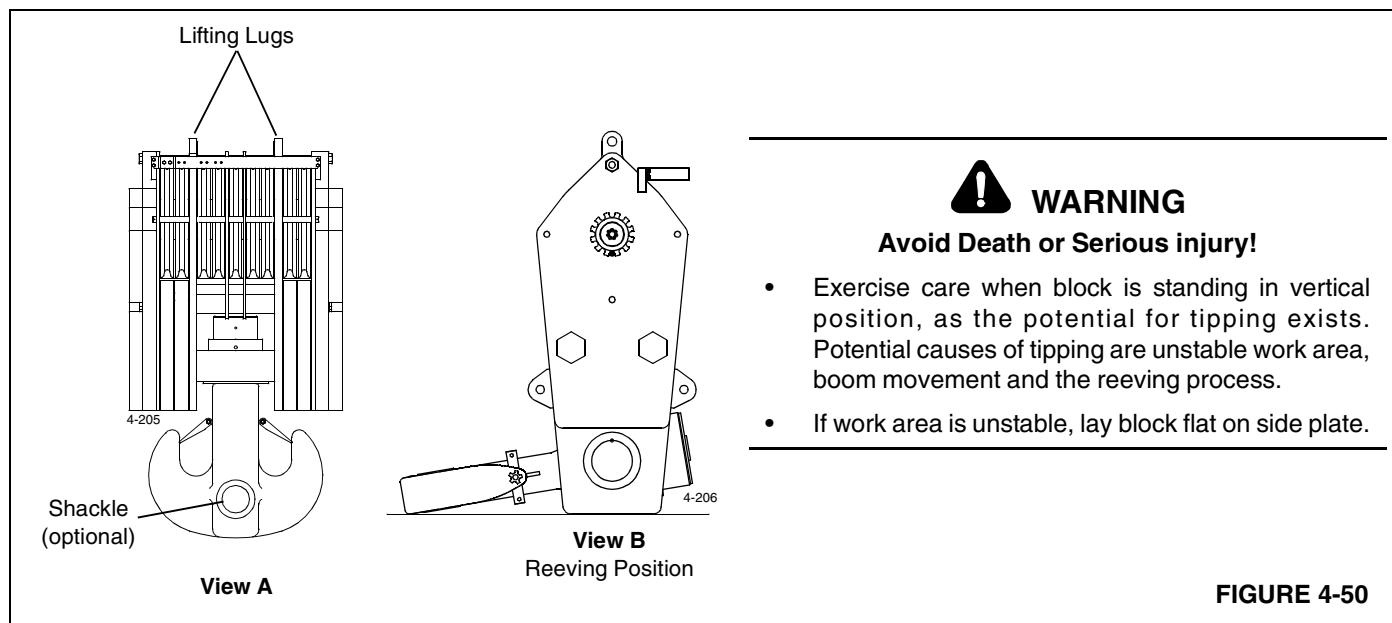
Reeving

See Figure 4-55 and Figure 4-56 for load block reeving. Reeving the load block in any manner other than shown can result in excessive block twist.

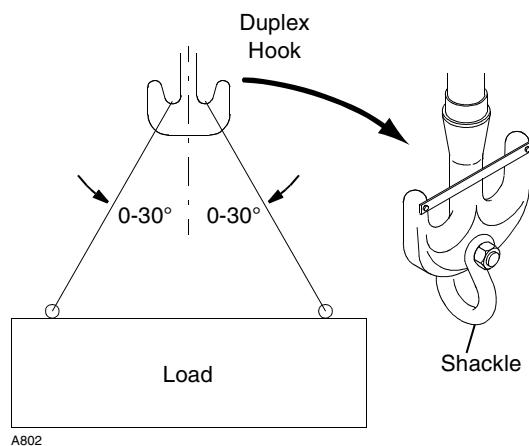
CAUTION

Wire Rope Damage!

Do not hoist load block closer to boom point than shown on Load Block Reeving charts. Improper fleet angle or contact with other parts can damage wire rope.

**WARNING****Avoid Death or Serious injury!**

- Exercise care when block is standing in vertical position, as the potential for tipping exists. Potential causes of tipping are unstable work area, boom movement and the reeving process.
- If work area is unstable, lay block flat on side plate.

FIGURE 4-50**FIGURE 4-51**

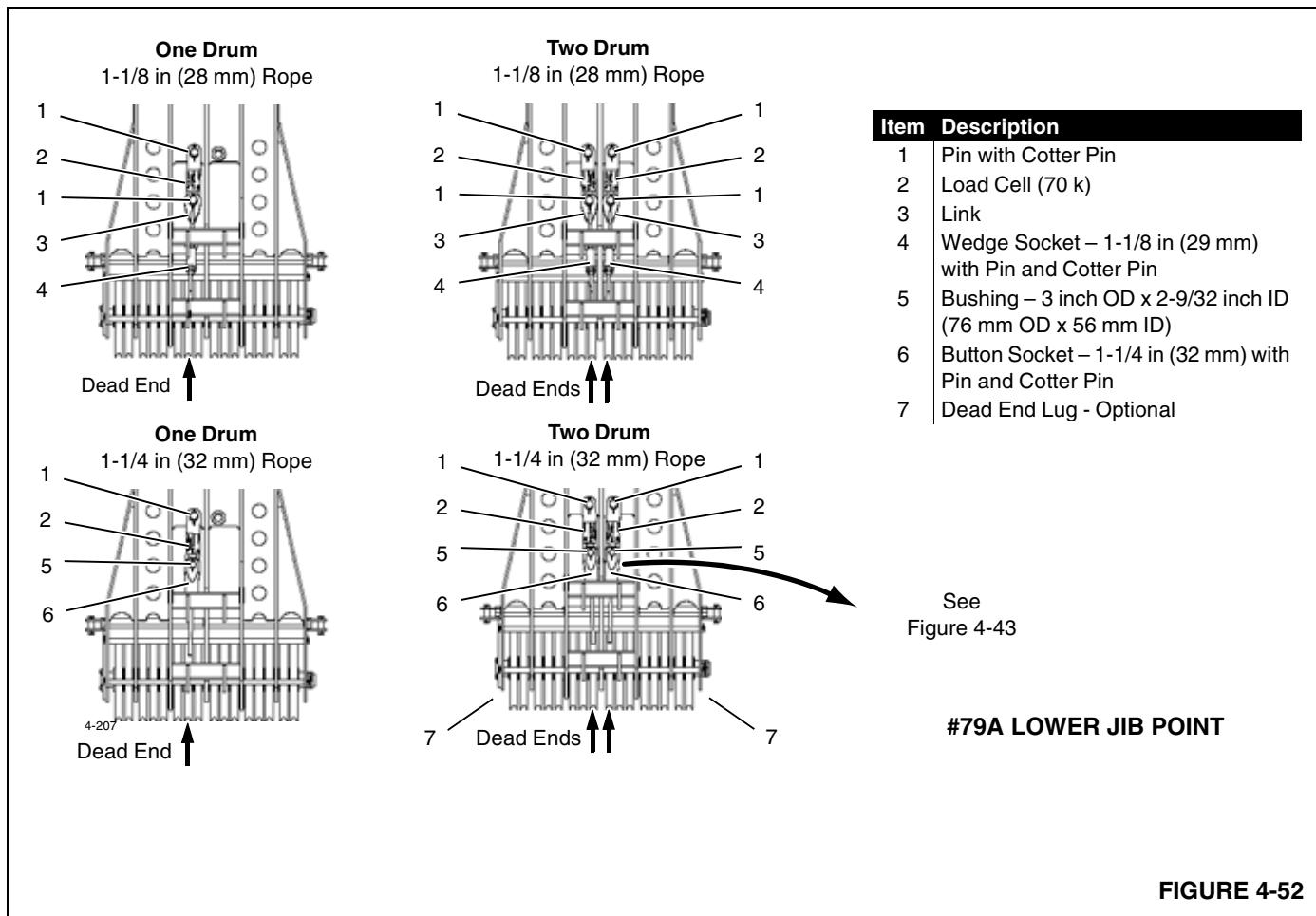
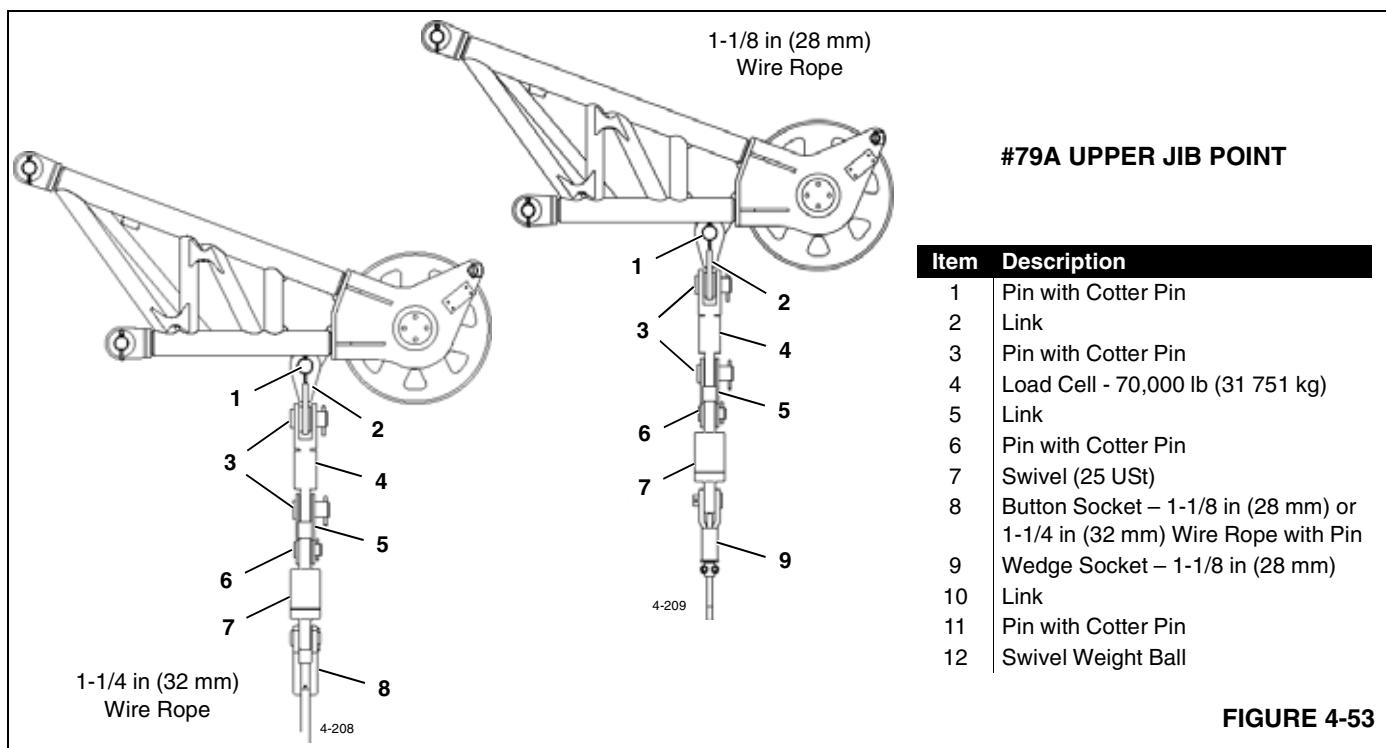
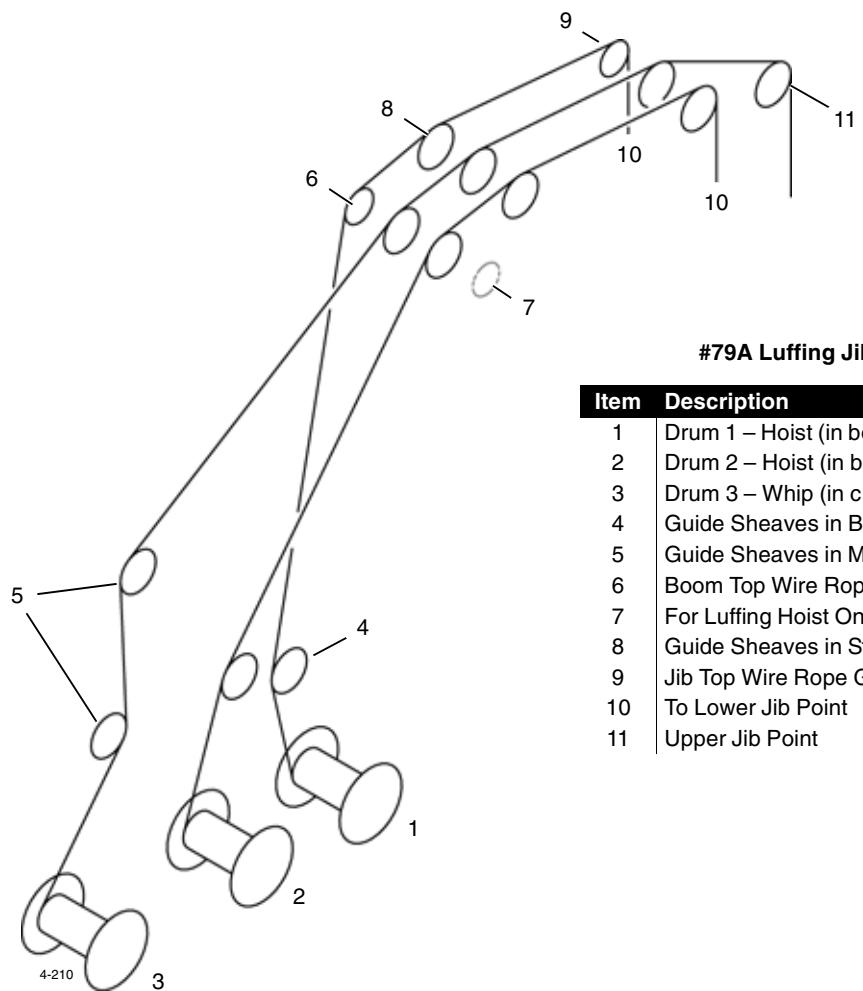


FIGURE 4-52



A08237



#79A Luffing Jib

Item	Description
1	Drum 1 – Hoist (in boom insert)
2	Drum 2 – Hoist (in boom butt)
3	Drum 3 – Whip (in crane)
4	Guide Sheaves in Boom
5	Guide Sheaves in Mast
6	Boom Top Wire Rope Guide
7	For Luffing Hoist Only
8	Guide Sheaves in Strut
9	Jib Top Wire Rope Guide
10	To Lower Jib Point
11	Upper Jib Point

FIGURE 4-54

4-211

**SINGLE HOIST DRUM REEVING
#79A Top**

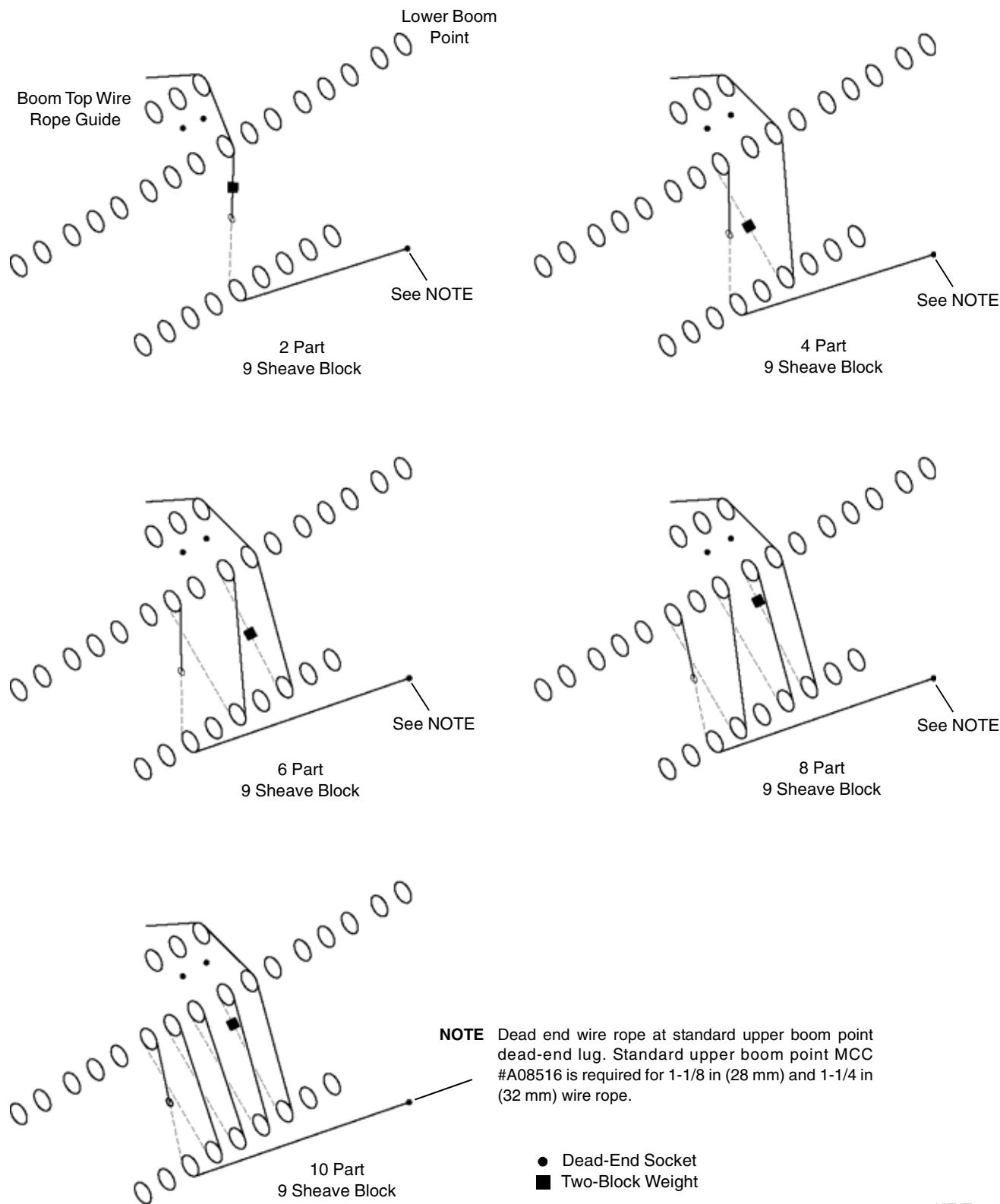
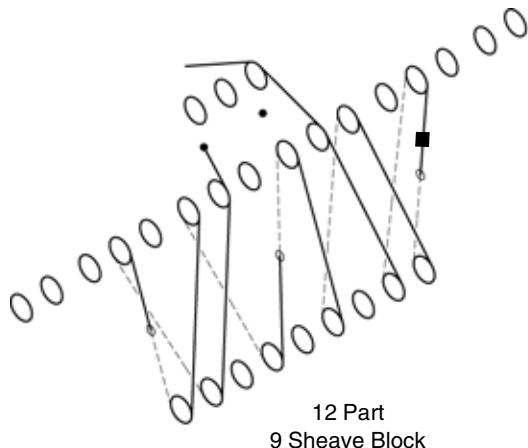


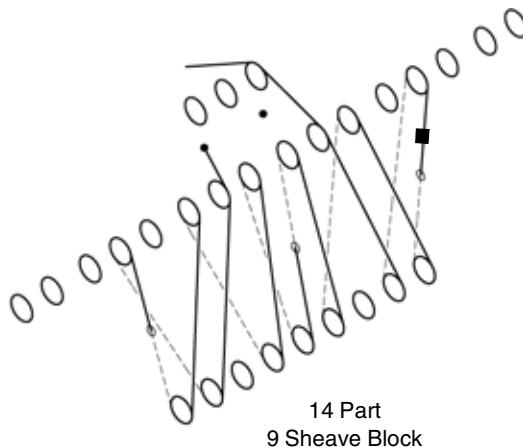
FIGURE 4-55

4-212

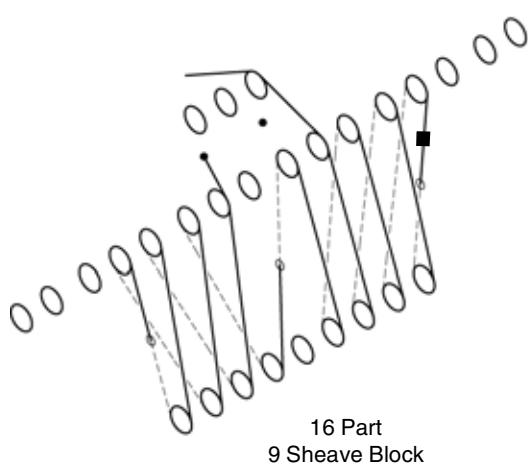
**SINGLE HOIST DRUM REEVING
#79A Top**



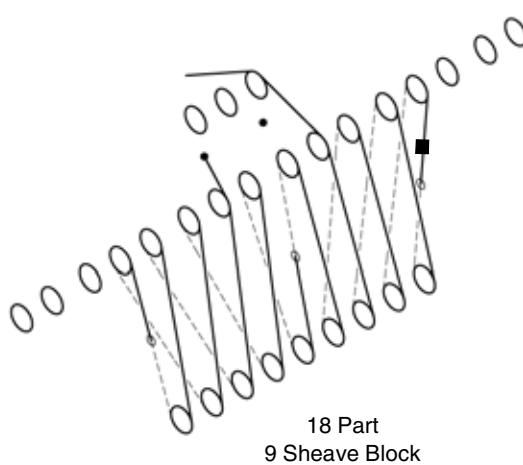
12 Part
9 Sheave Block



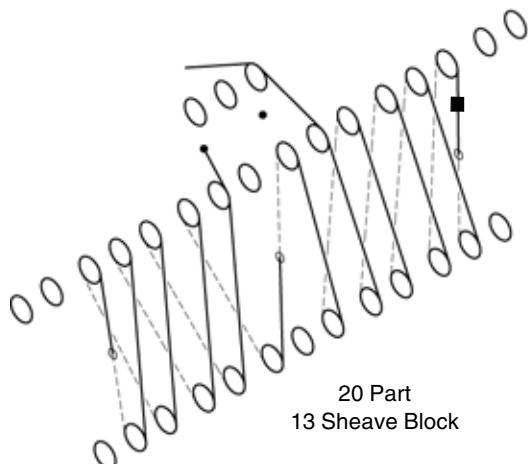
14 Part
9 Sheave Block



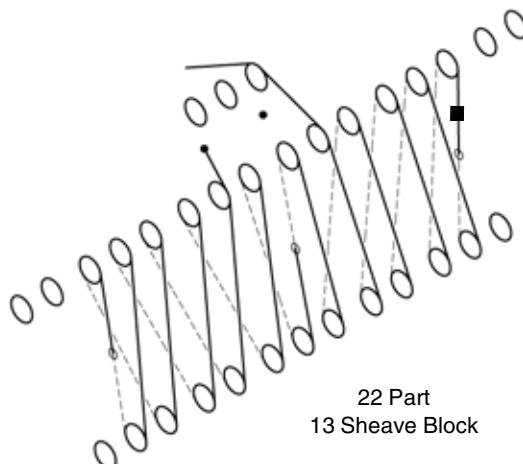
16 Part
9 Sheave Block



18 Part
9 Sheave Block



20 Part
13 Sheave Block



22 Part
13 Sheave Block

4

FIGURE 4-55 continued

4-213

SINGLE HOIST DRUM REEVING
#79A Top

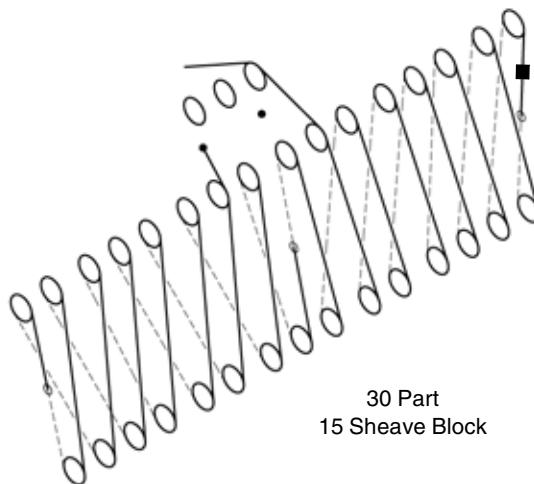
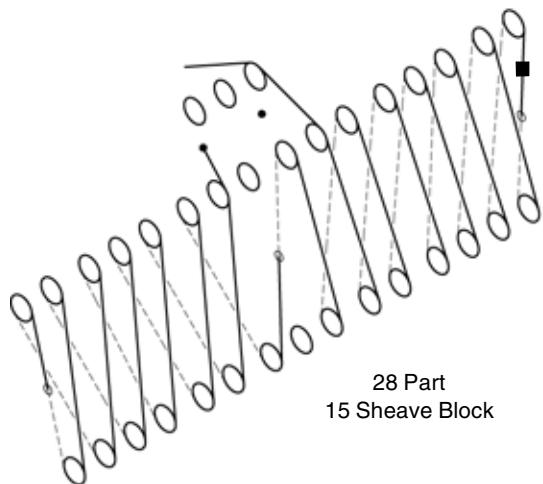
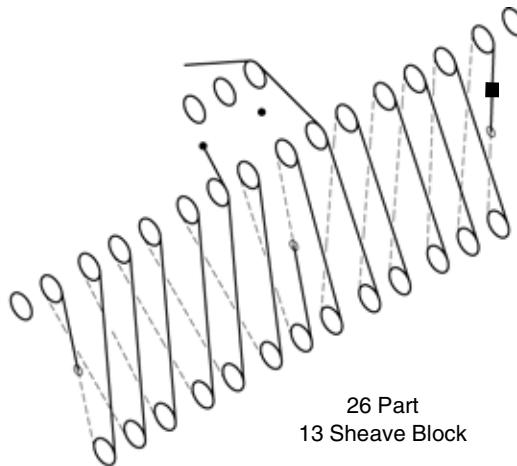
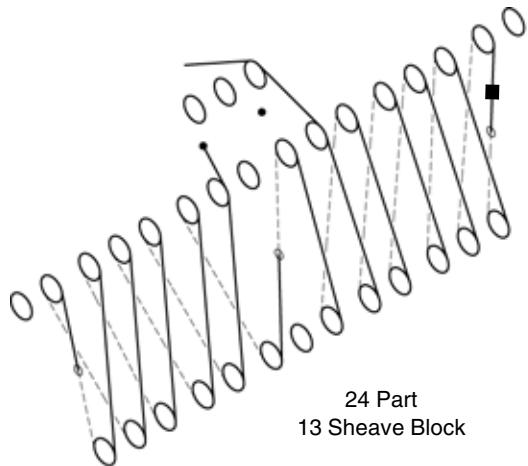
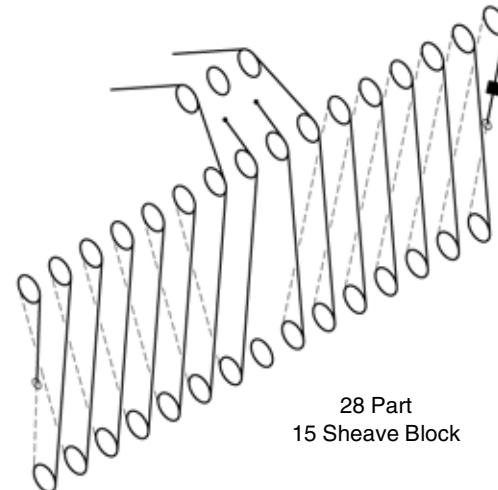
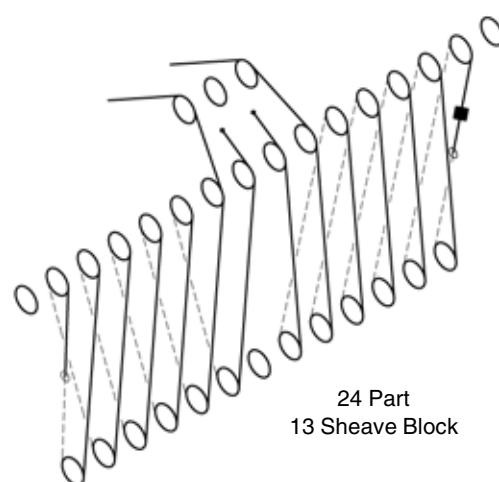
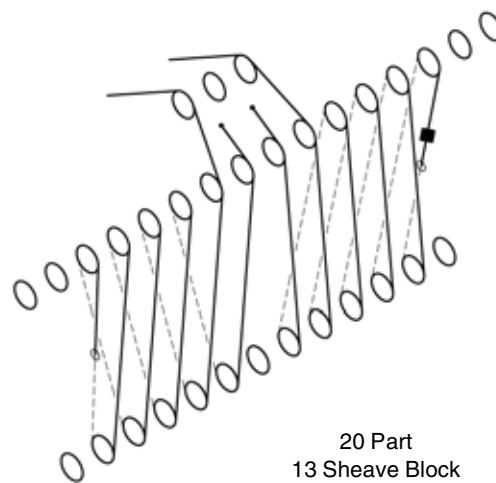
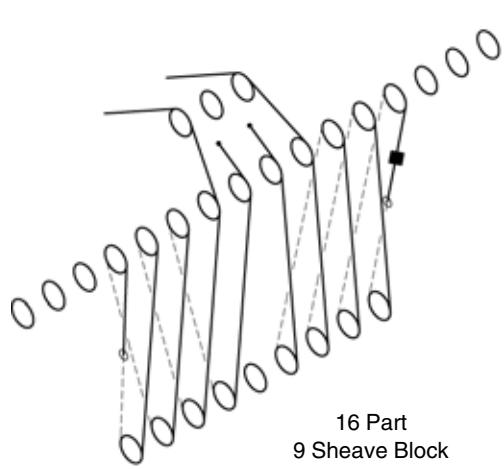
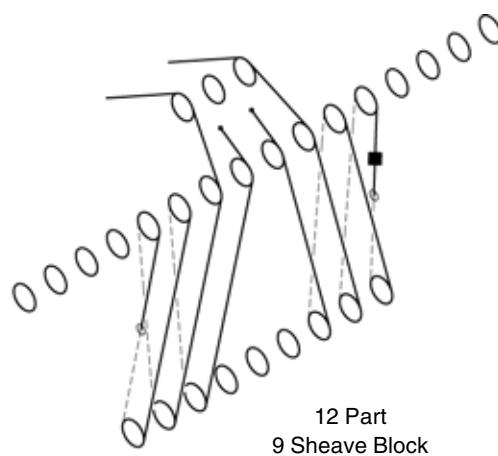
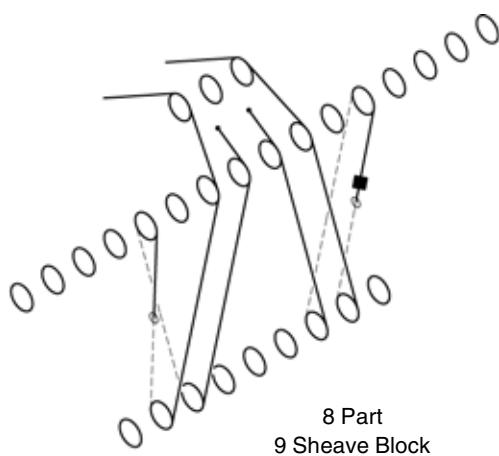


FIGURE 4-55 continued

4-214

**TANDEM HOIST DRUM REEVING
#79A Top**



4

FIGURE 4-56

BLOCK LEVEL SENSOR ADJUSTMENT

General

The block level sensors (Figure 4-57) ensure that the load block remains level when two load lines — Drums 1 and 2 — are routed to the load block over the #79A luffing jib top.

NOTE: This block level sensor is only on cranes without wireless communication. On cranes with wireless communication, the controller adjusts block level automatically (see Crane Diagnostics, Block Level Sensor topic in Section 3 of Operator's Manual).

The sensors monitor guide sheave rotation speed. The crane's programmable controller uses signals from the sensors to equalize the rotation speed of the drums so the load block remains level.

The sensors were adjusted at the factory and need to be readjusted only when a new sensor is installed or the position of a sensor is changed.

Sensor Adjustment

1. If necessary, attach mounting bracket to guide sheave frame with cap screws.
2. Loosen jam nut securing sensor to bracket.
3. Turn sensor in or out to obtain specified dimension between end of sensor and wall of sheave.
4. Tighten jam nut.
5. Check for proper operation without load. Drums should operate at same speed and load block should remain level.

Readjust sensor if required.

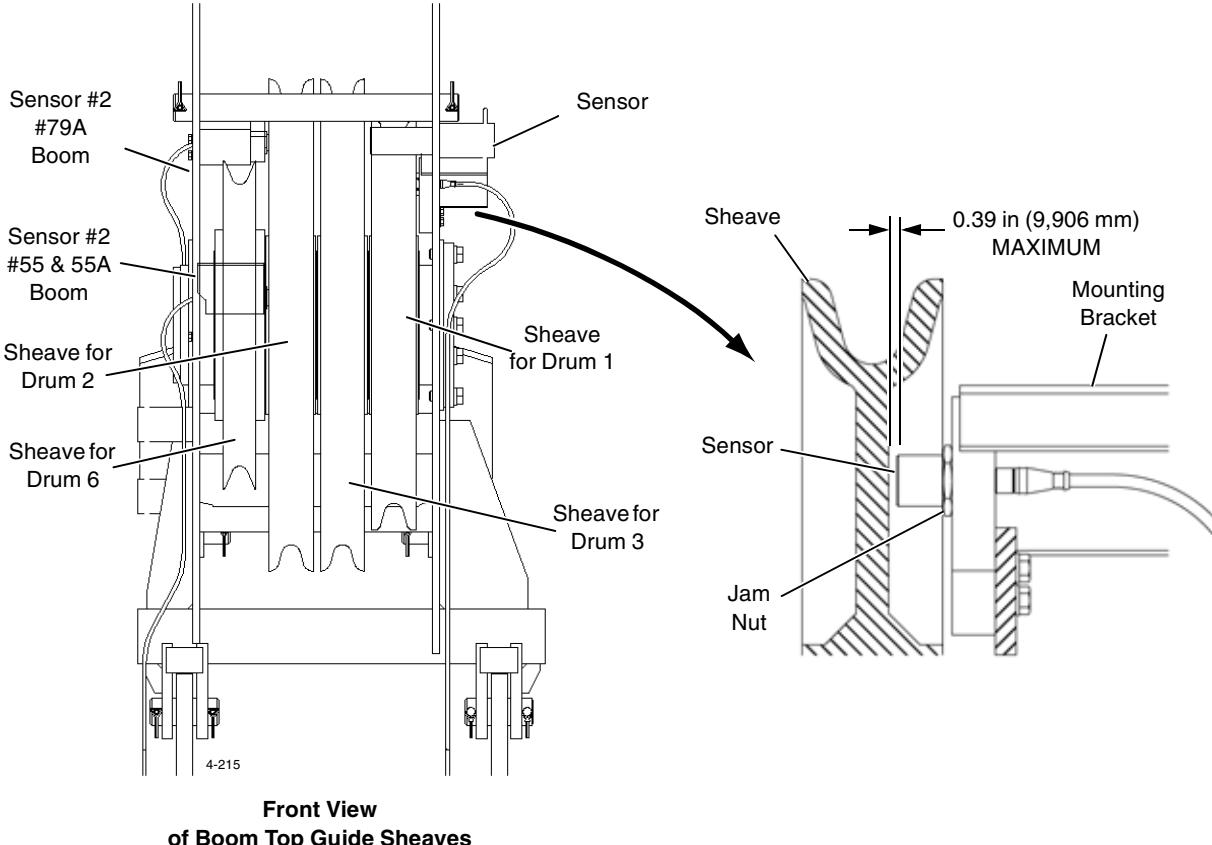


FIGURE 4-57



OPERATOR'S MANUAL SECTION 4 INSERTS
18000 Luffing Jib – Serial Number 18005910

RIGGING, RAISING PROCEDURES, ELECTRICAL WIRING & WIRE ROPE DATA

Drawing A07766 01/30/2007 Luffing Jib Asm, #44 Luffing Jib

Raising & Lowering –

Chart 8542-A 04/14/2004 Luffing Jib Raising Procedure

Electrical Assembly –

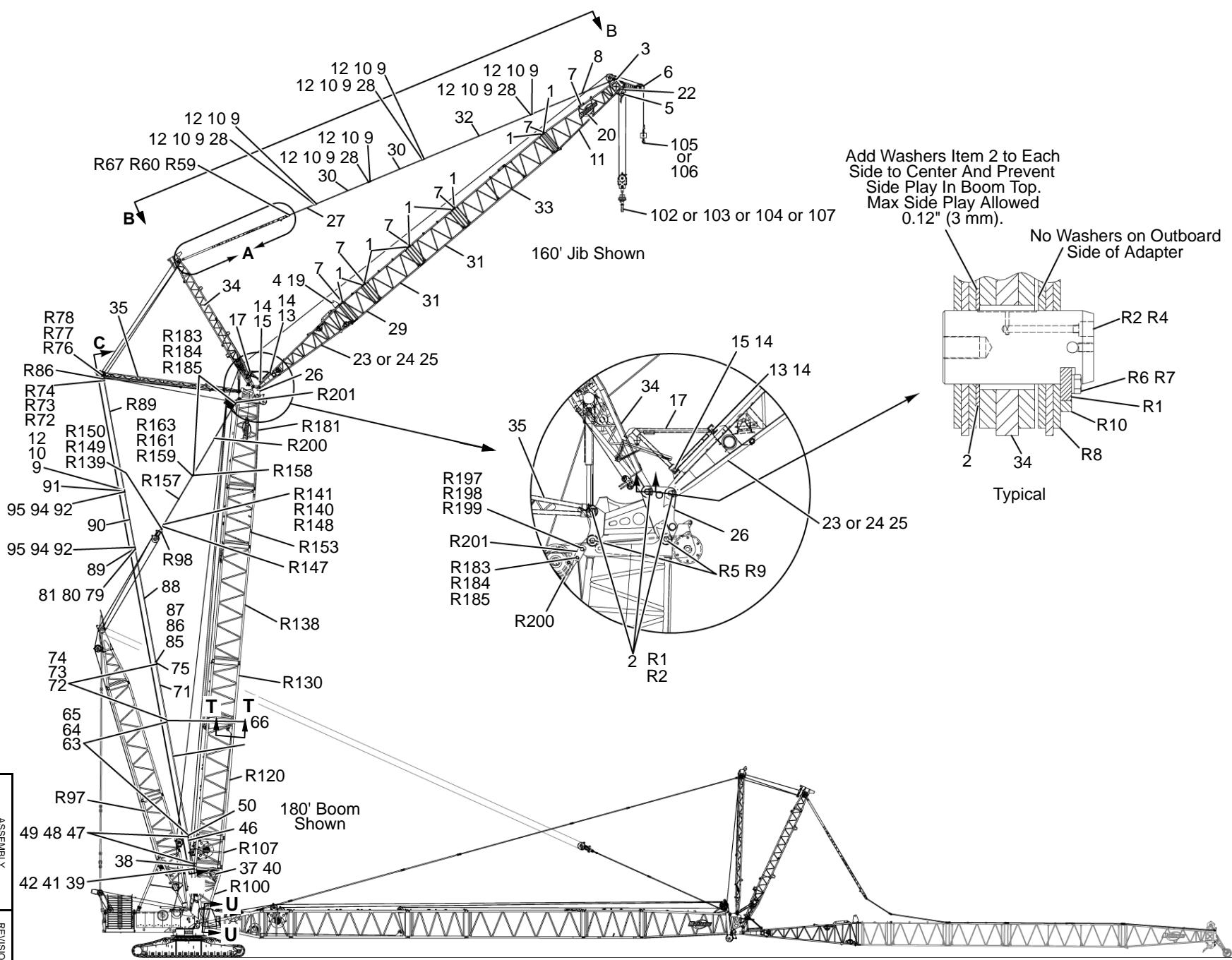
Drawing A05580 06/19/2008 Control Wiring, Boom & Limits

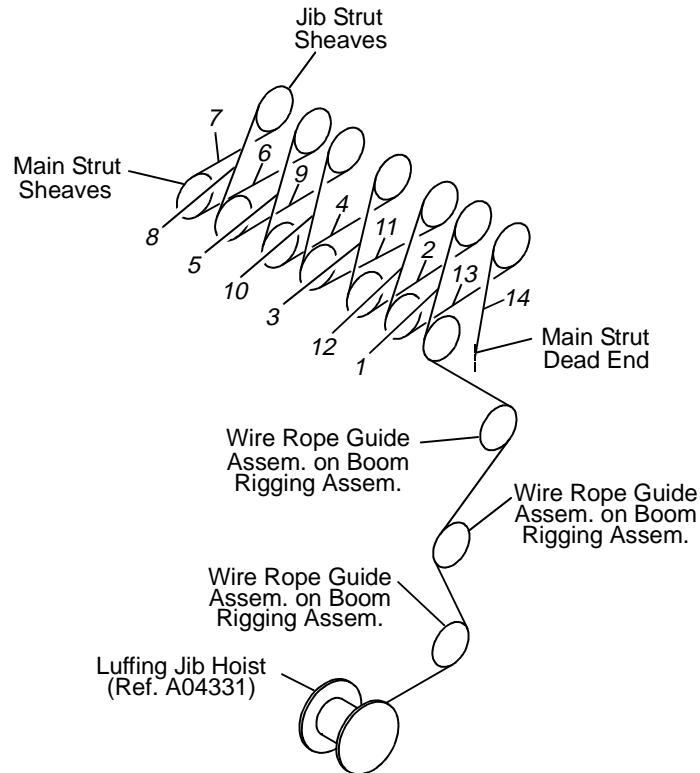
Drawing 184433 01/31/1997 Load Block Conversion

OEM Wire Rope Data –

TBRR-192 08/01/1996 Bridon Tech Bull – Rotation Resist Ropes
P/N2010170 05/01/2002 Crosby Terminator Wedge Socket Warning and Application Instructions

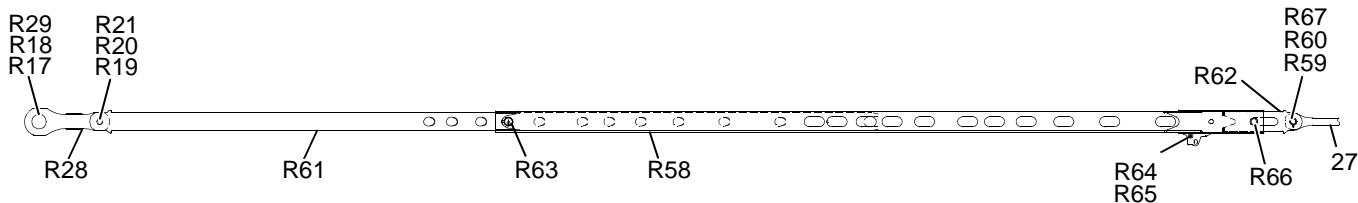
A07766	ASSEMBLY
B	REVISION

LUFFING JIB, #44 LUFFING JIB



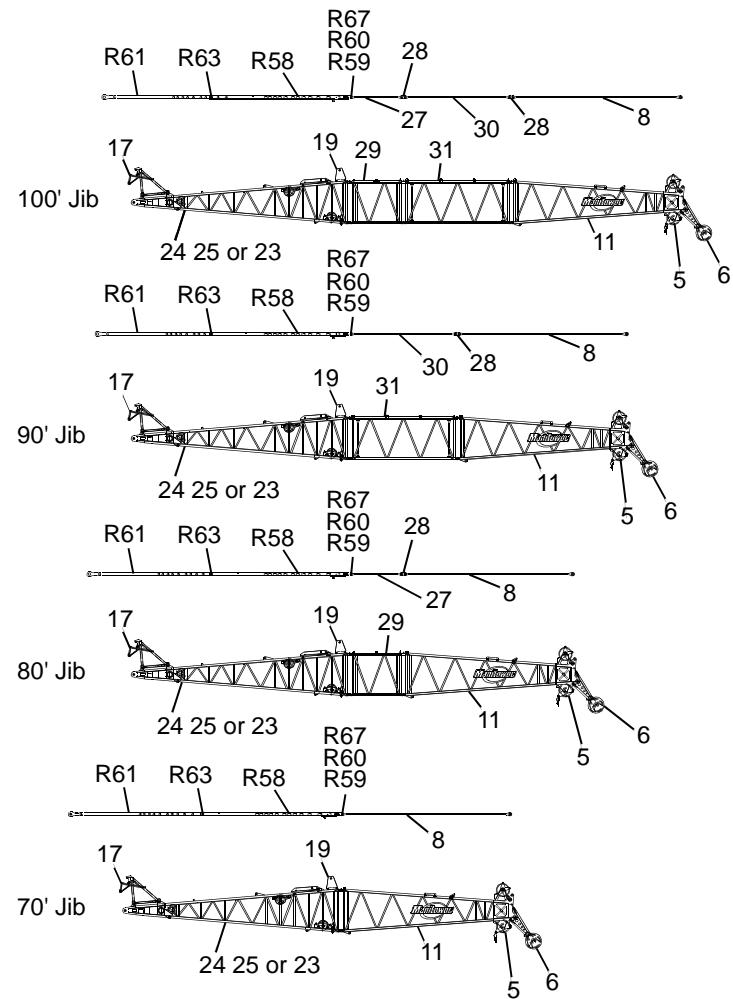
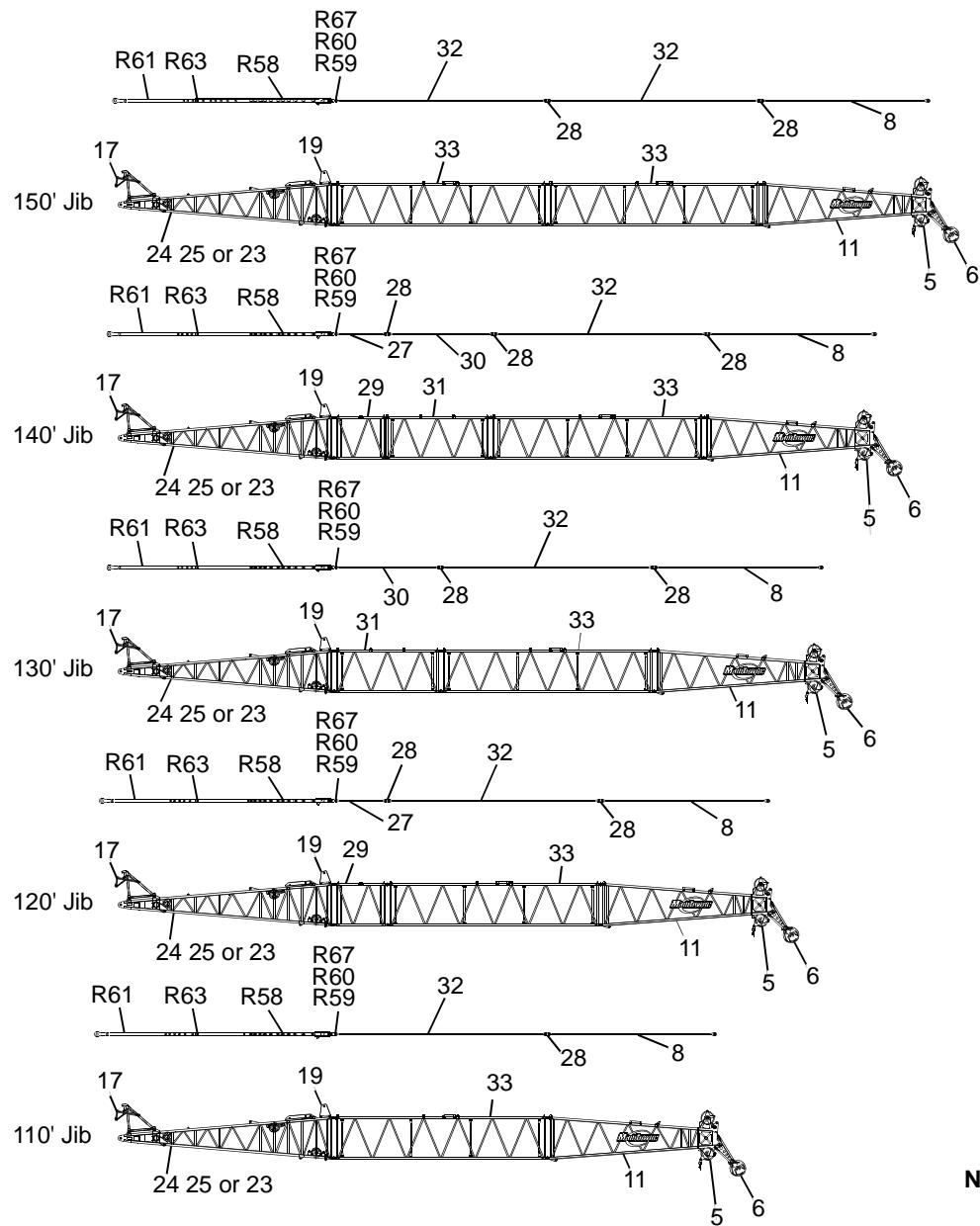
Luffing Jib Hoist Reaving
Diagram For 14 Part Line

1700' (500 m) of 1.00" Constructex
(Part A14127) - B.S. = 125,000



View A

Rotated: 23.4° CW



Note: See Table on page 22 For Alternate combinations

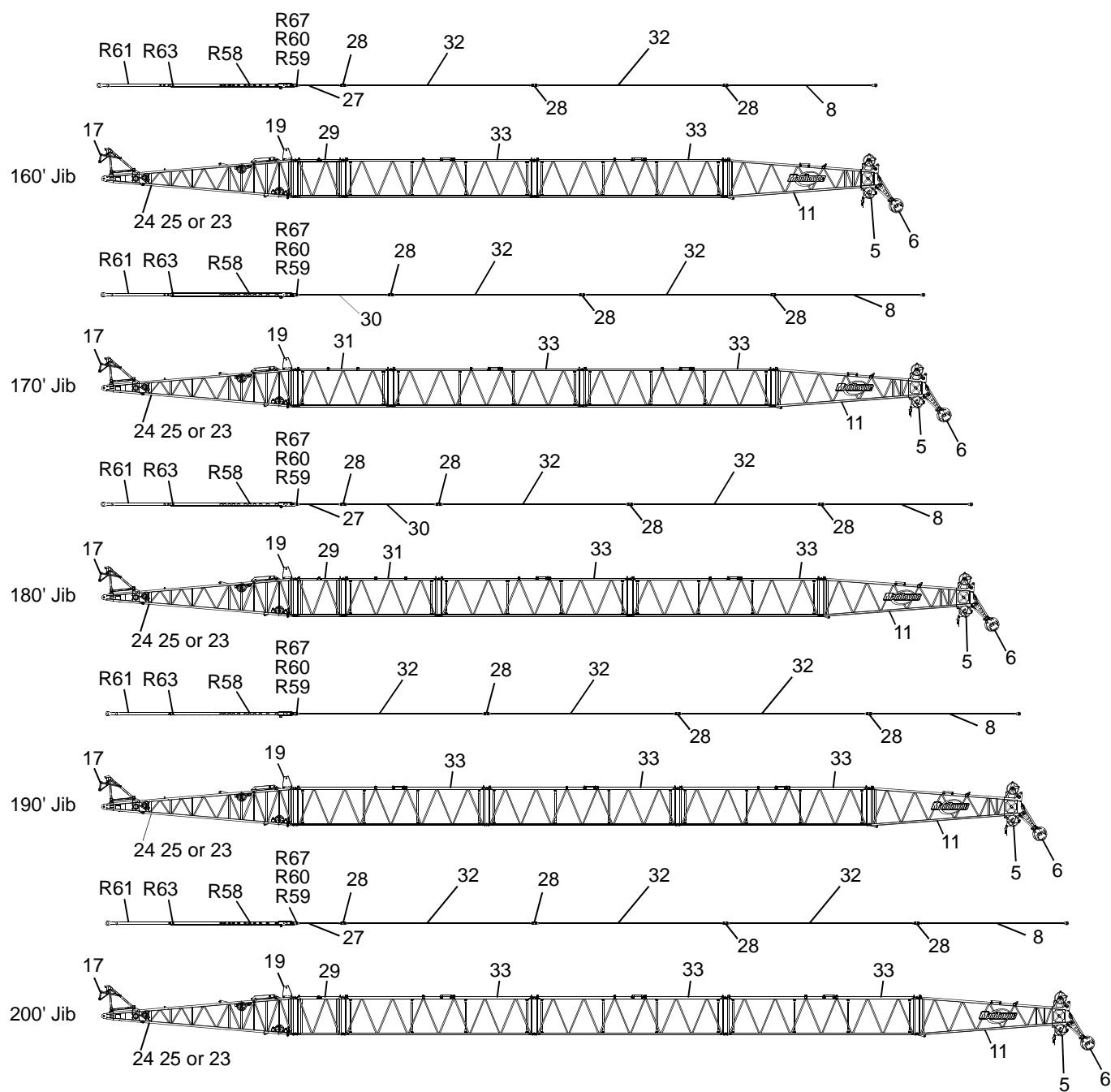
Note: See Table on page 22 For Alternate combinations

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3 of 22

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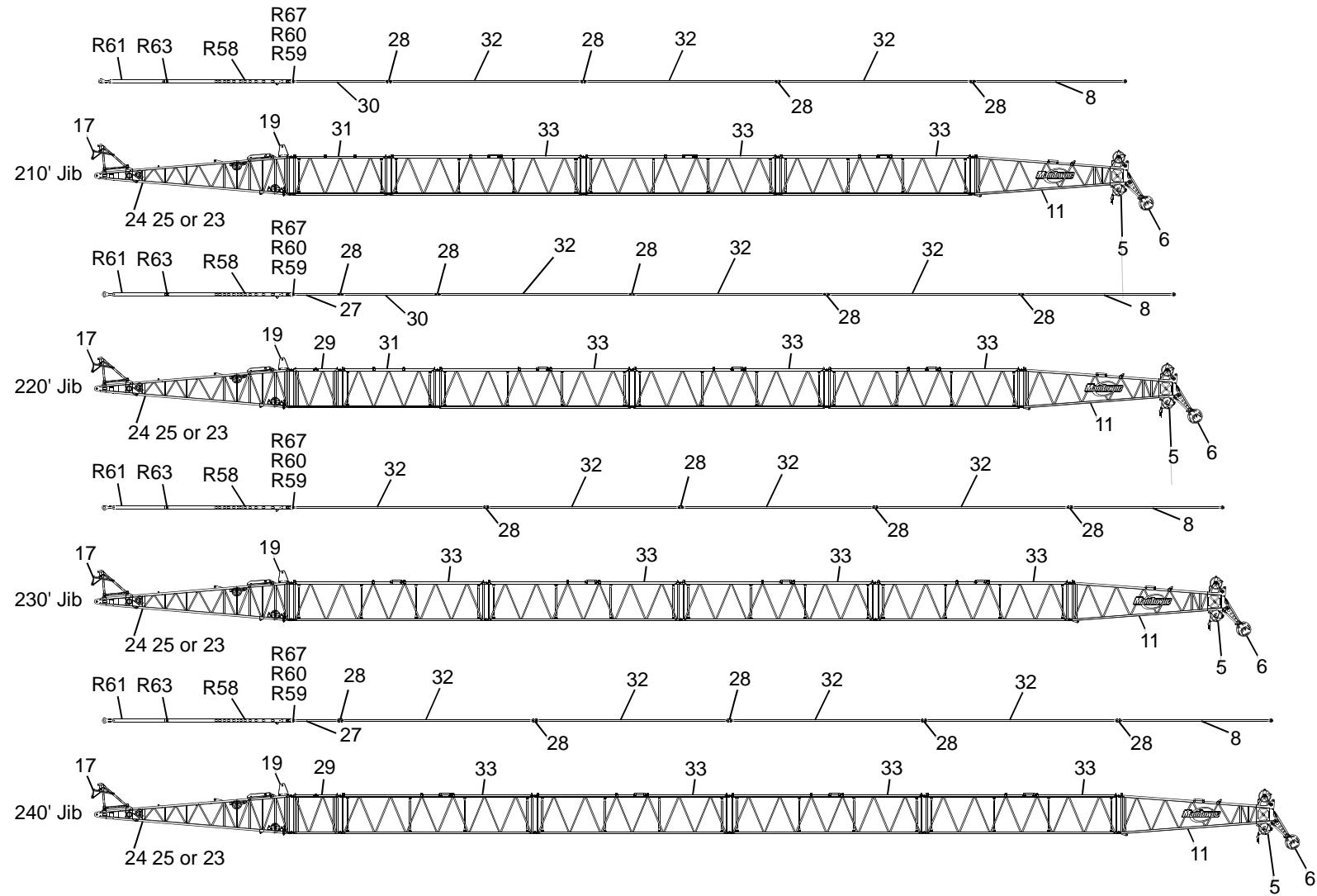


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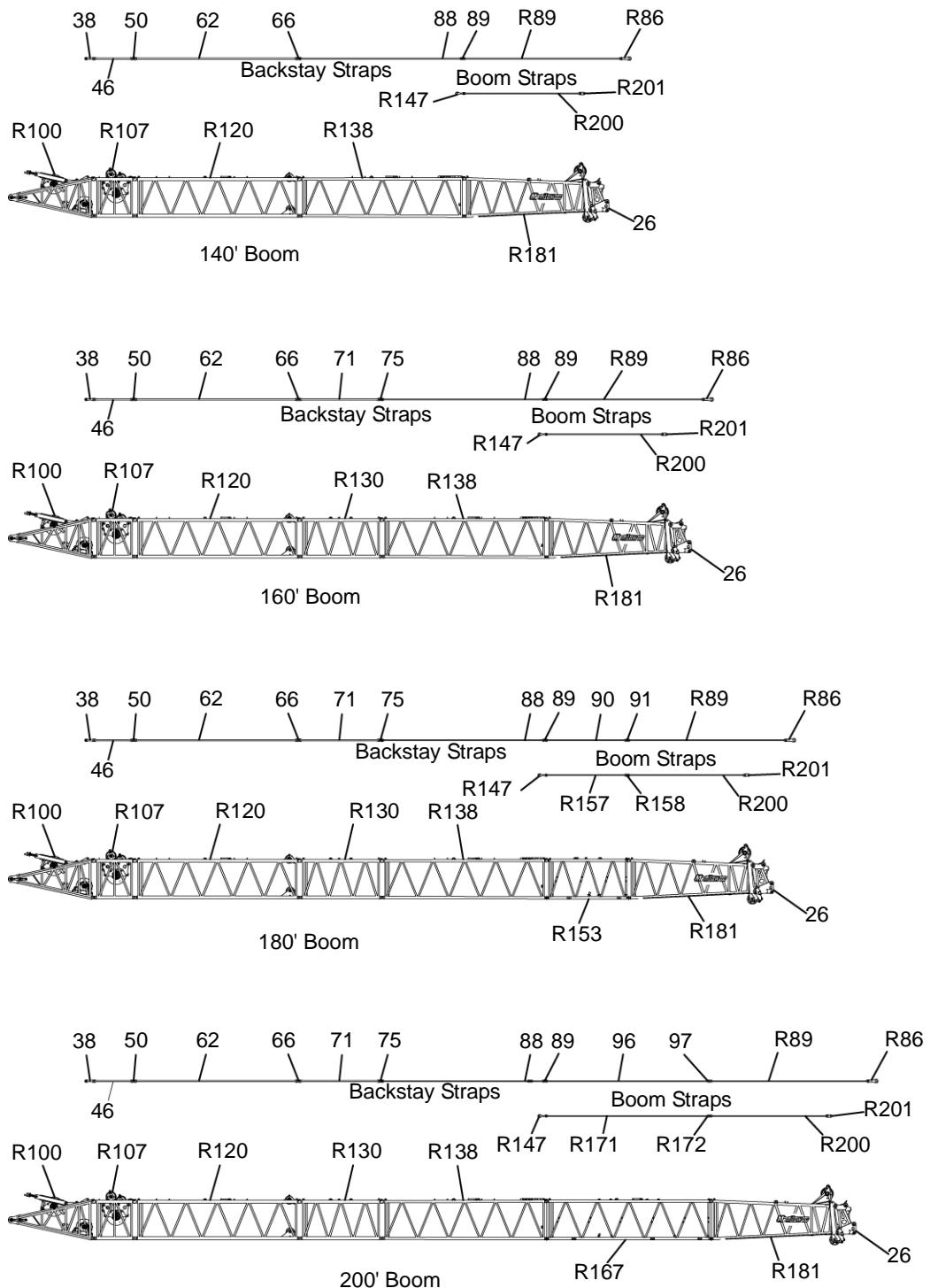
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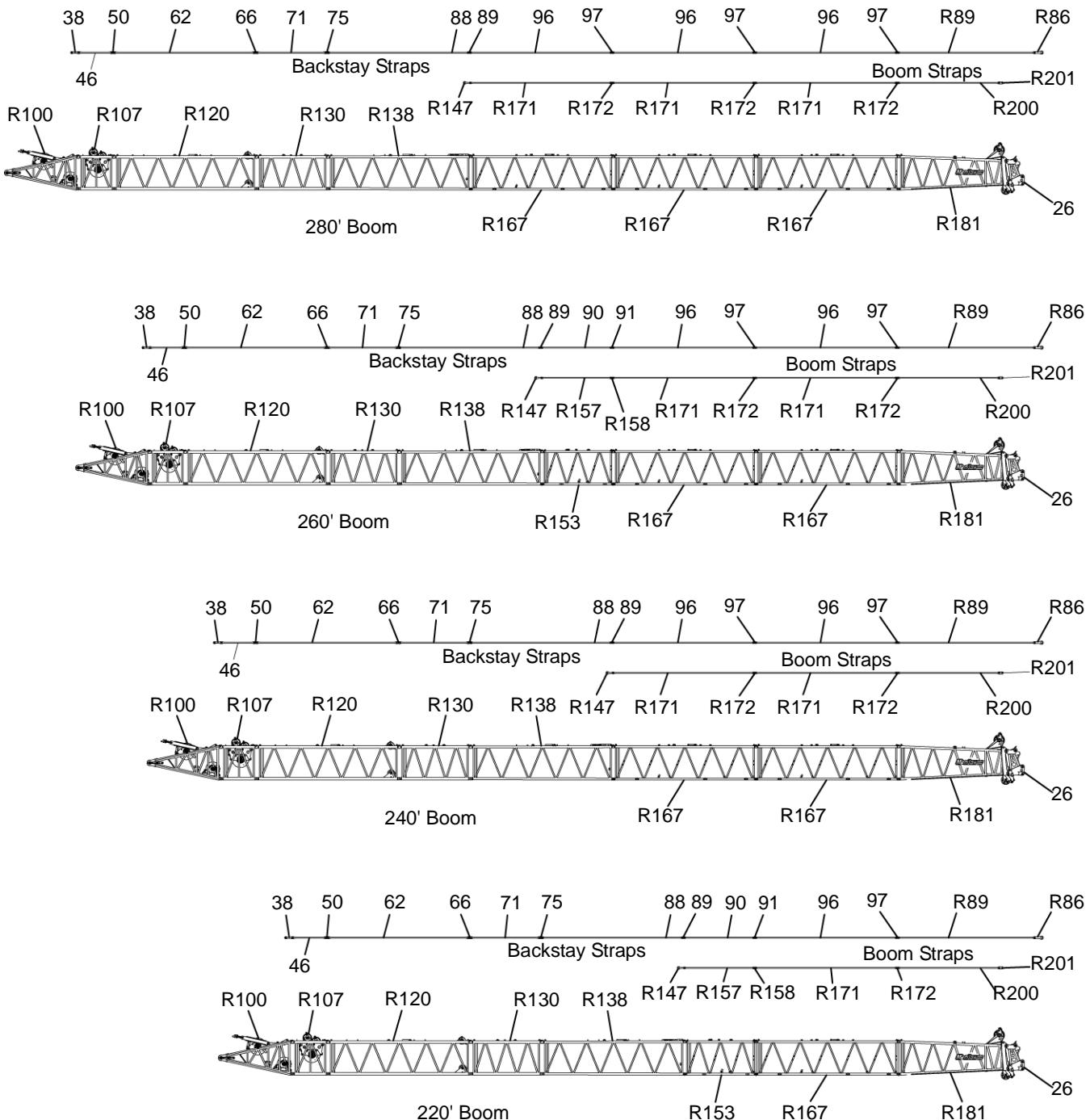


#55/79A Boom Assembly
(Reference Boom Rigging Assembly 100' Mast - A05379)

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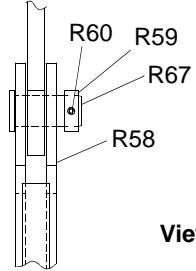
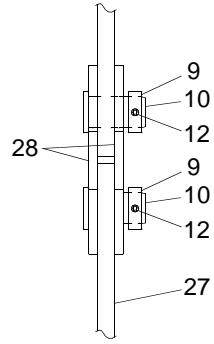
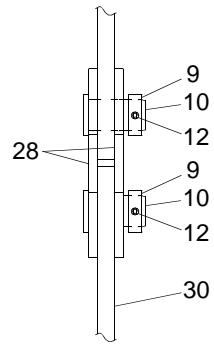
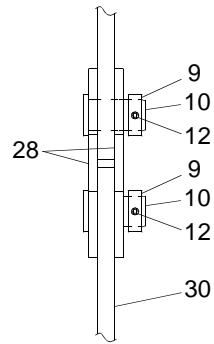
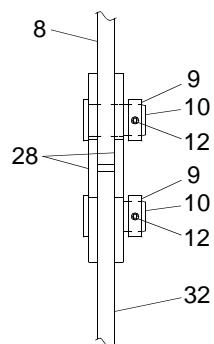
MANITOWOC CRANES, INC.



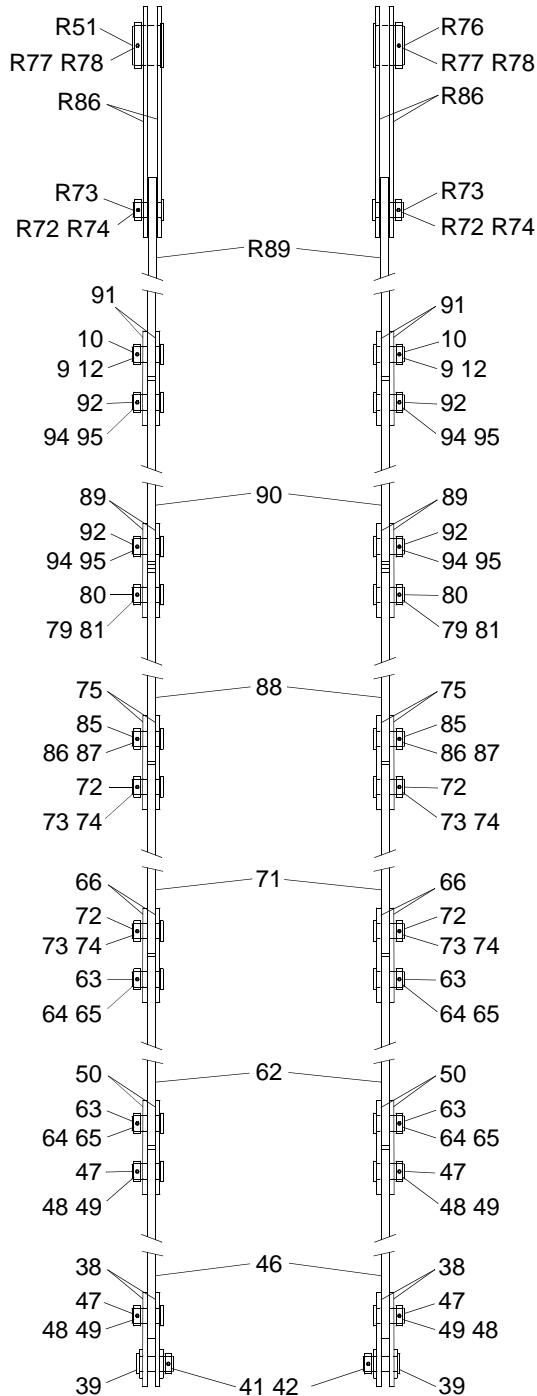
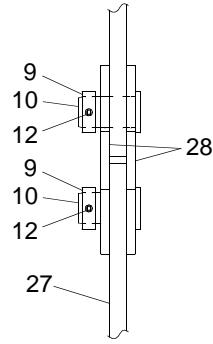
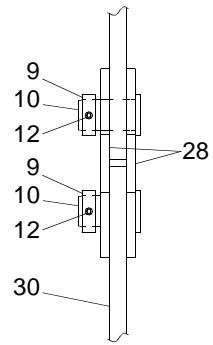
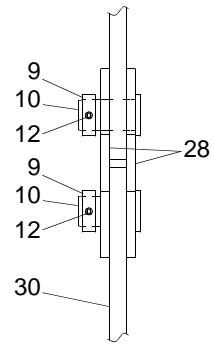
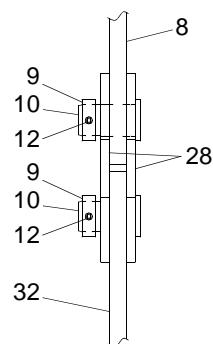
#55/79A Boom Assembly
(Reference Boom Rigging Assembly 100' Mast - A05379)

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View B-B



View C-C

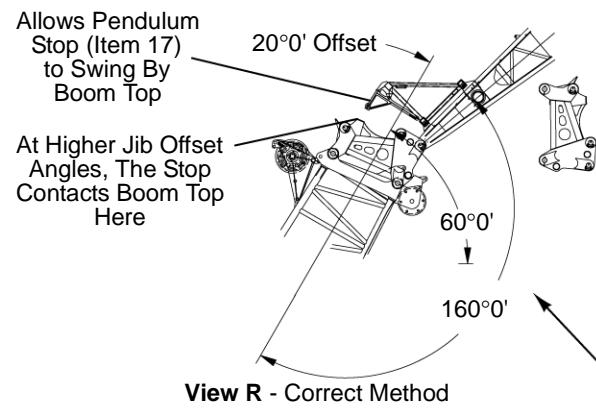
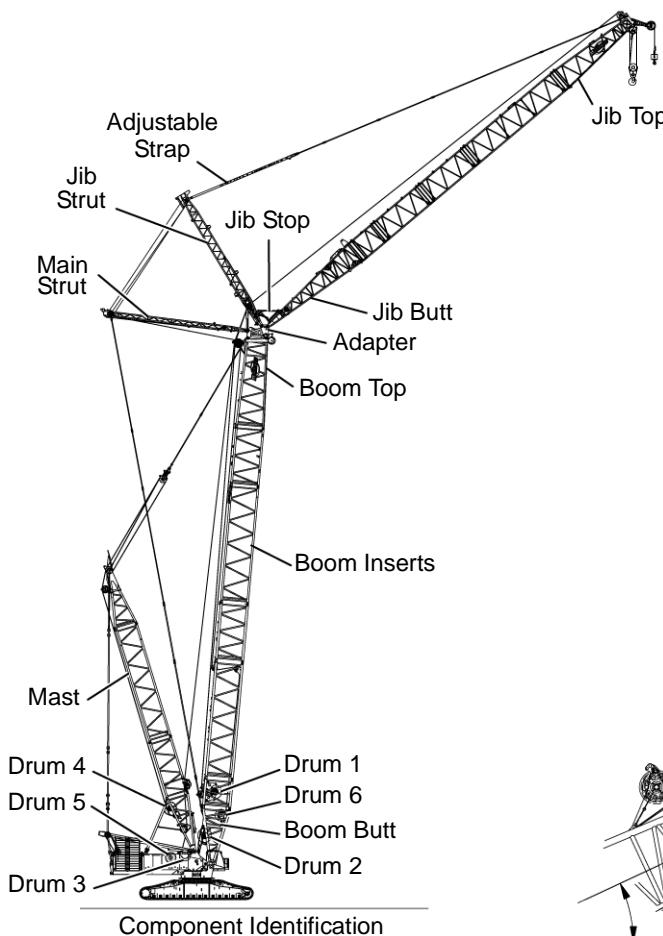
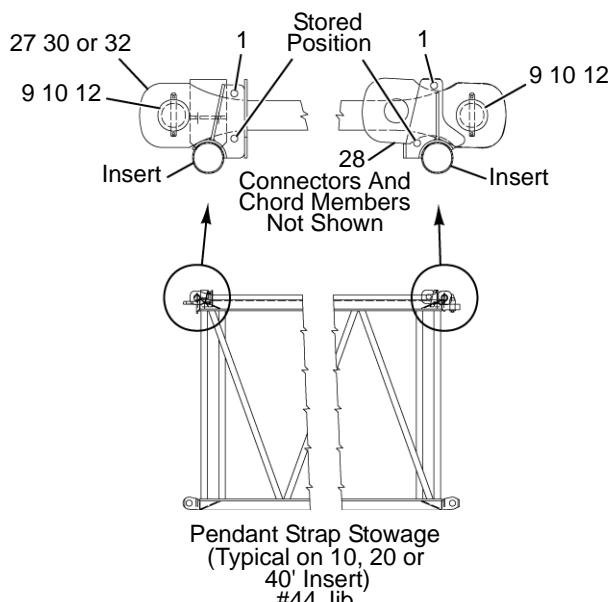
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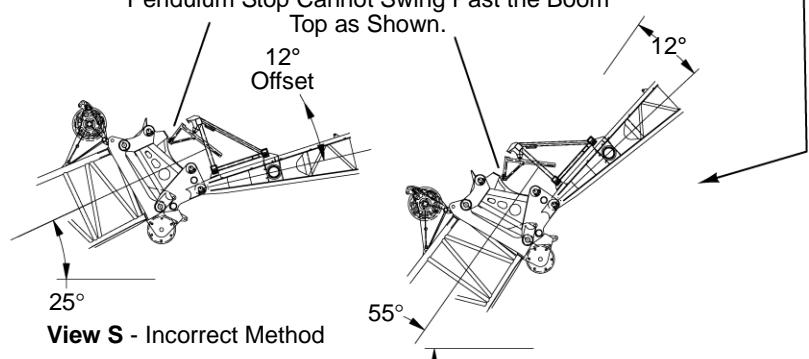
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Warning - Structural Damage
If The Jib Offset Angle Is Not Increased
to 20° After a 60 to 20° Boom Angle, Then the
Pendulum Stop Cannot Swing Past the Boom
Top as Shown.



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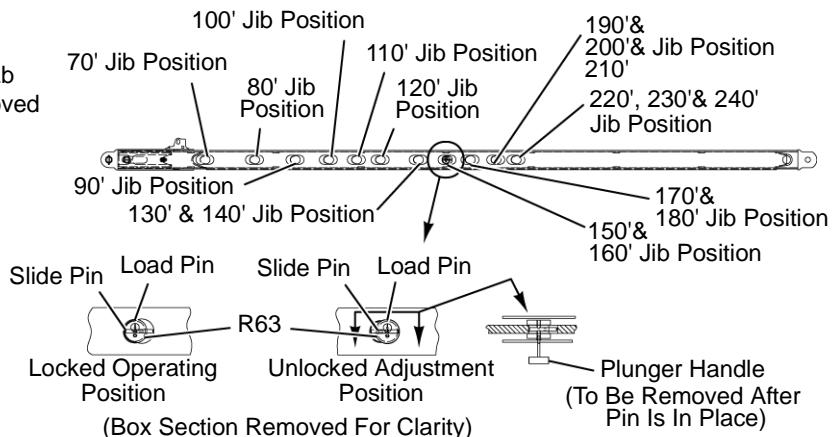
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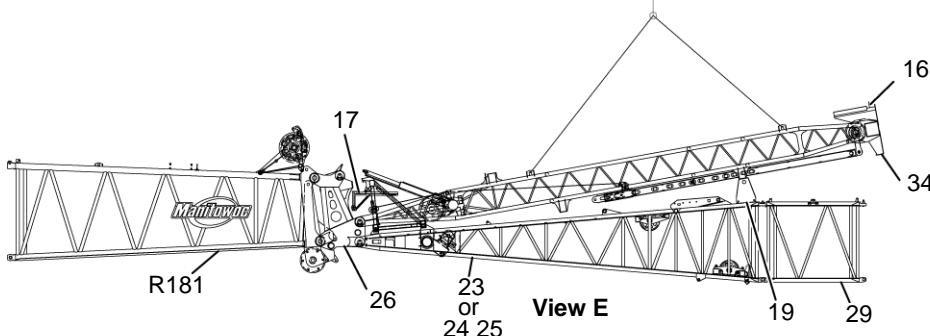
Approx. Shipping Position Weight = 23,245 Lb
Shipping Width = 8' 3" w/ Winch Handles Removed



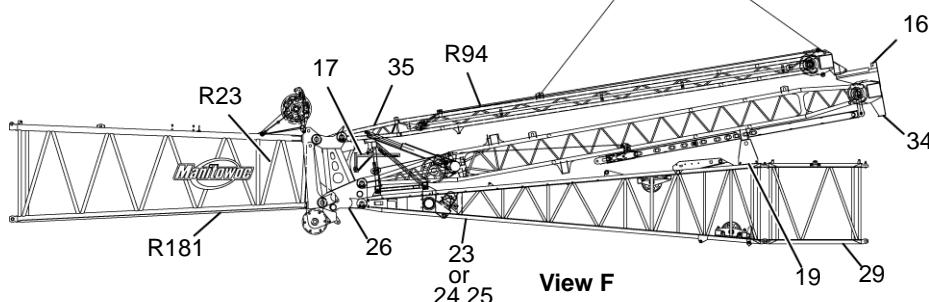
View D
Shipping And Handling



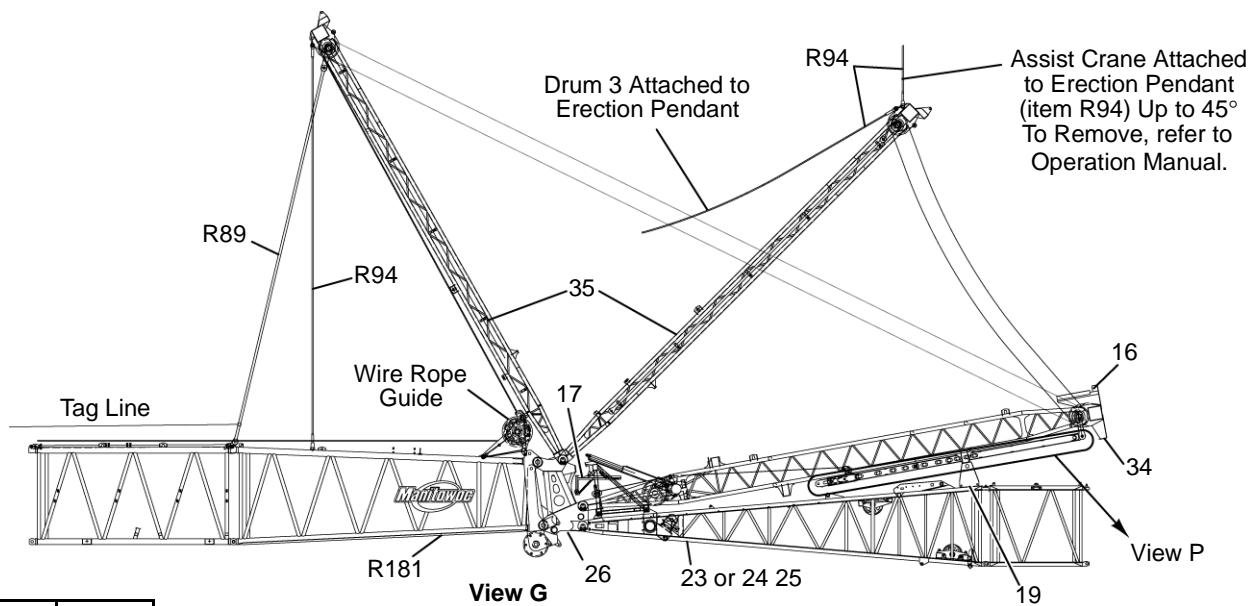
View P
Shown In 160' Jib Position



View E



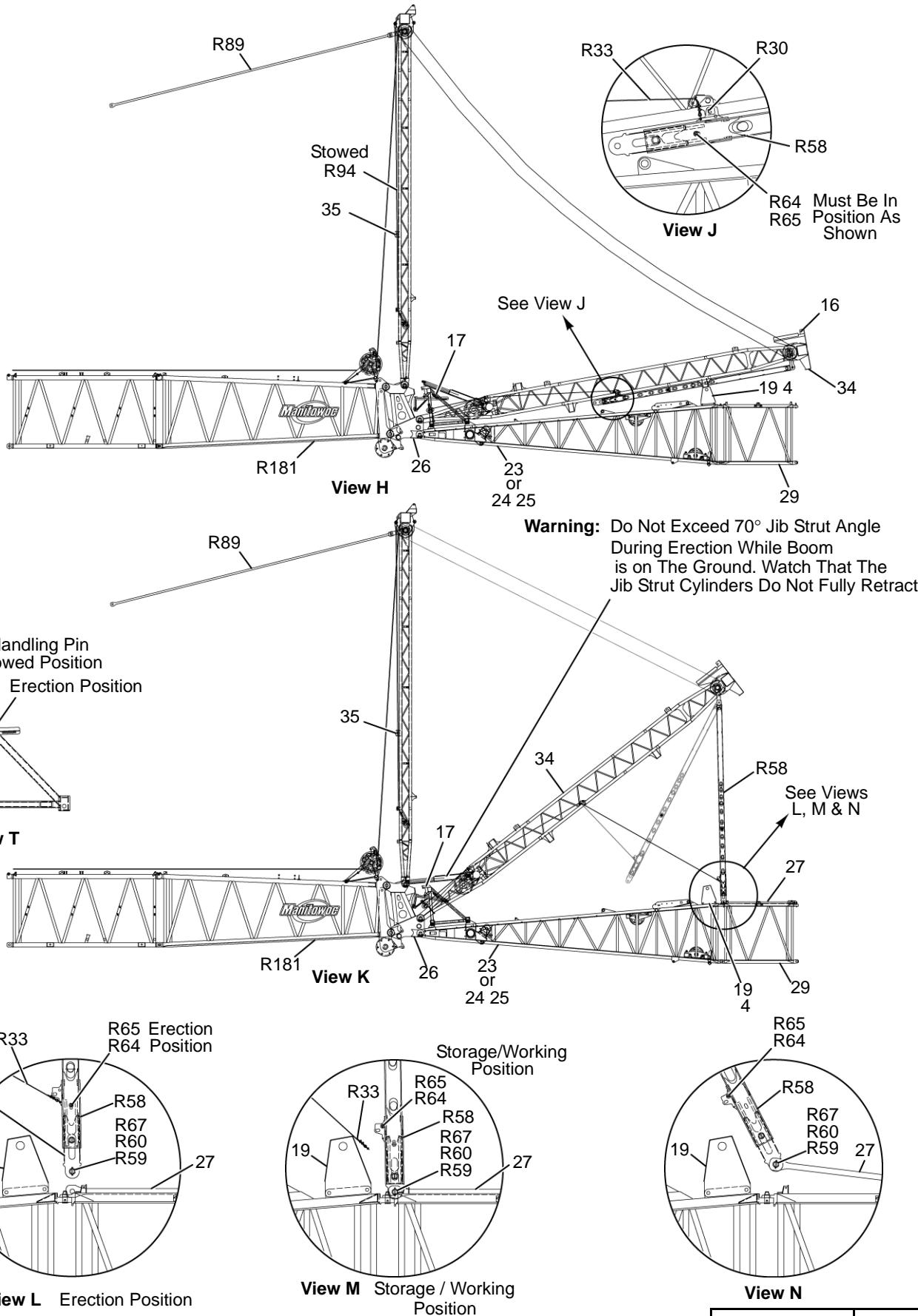
View F



ASSEMBLY
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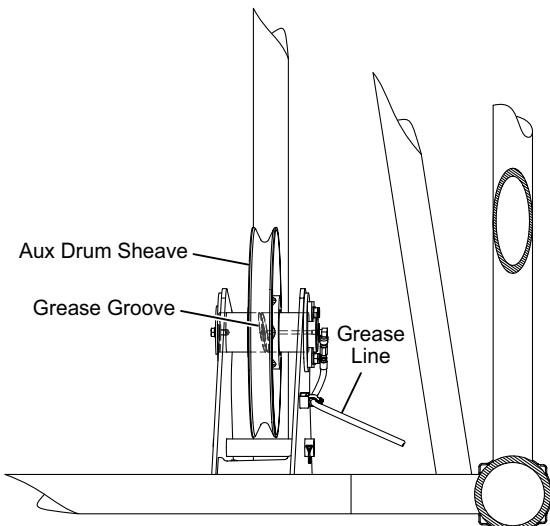
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MANITOWOC CRANES, INC.



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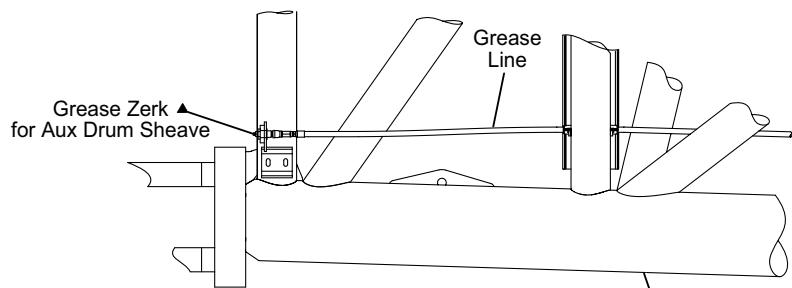
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View T-T

Greasing Aux Drum Sheave

- 1: Raise or lower jib until aux drum sheave is in the center of its shaft and grease groove is completely covered by sheave.
- 2: Pump grease through grease zerk in boom butt.
- 3: Before initial boom raising, connect grease line sections and pump grease through line until grease begins to come out of grease hole in shaft.



View U-U

INSERT ASSEMBLIES REQUIRED FOR VARIOUS BOOM LENGTHS

ITEM NO.		R107	R120	R130	R138	R153	R167
BOOM LENGTH		INSERT ASSEMBLY #55 BOOM 10' 0" (3.05 m) ITEM R106	INSERT ASSEMBLY #55 BOOM W/SHEAVES 40' 0" (12.19 m) ITEM R119	INSERT ASSEMBLY #55 BOOM 20' 0" (6.10 m) ITEM R129	INSERT ASSEMBLY #55 BOOM TRANSITION 55/79 40' 0" (12.19 m) ITEM R139	INSERT ASSEMBLY #79 BOOM 20' 0" (6.10 m) ITEM R152	INSERT ASSEMBLY #79 BOOM 40' 0" (12.19 m) ITEM R166
FEET	METERS						
140	42.7	1	1	0	1	0	0
160	48.8	1	1	1	1	0	0
180	54.9	1	1	1	1	1	0
200	60.9	1	1	1	1	0	1
220	67.1	1	1	1	1	1	1
240	73.2	1	1	1	1	0	2
260	79.2	1	1	1	1	1	2
280	85.3	1	1	1	1	0	3

ASSEMBLY

A07766

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ADDITIONAL PARTS REQUIRED FOR VARIOUS JIB LENGTHS														ADJUSTABLE STRAP LENGTHS	
JIB LENGTH		INSERT 10' 0" (3.05 m) ITEM 29	INSERT 20' 0" (6.10 m) ITEM 31	INSERT 40' 0" (12.19 m) ITEM 33	STRAP 9' 4-3/4" (2.86 m) ITEM 27	STRAP 19' 4-3/4" (5.91 m) ITEM 30	STRAP 39' 4-3/4" (12.00 m) ITEM 32	PIN ITEM 1	TIMBER ITEM 7	BOOM SUPPORT LINK ITEM 28	COLLAR ITEM 9	PIN ITEM 10	PIN ITEM 12	POSITION	STRAP LENGTH
FEET	METERS														
70	23.3	0	0	0	0	0	0	0	0	0	0	0	0	70	580.00
80	24.4	1	0	0	2	0	0	4	1	4	4	4	4	80	557.87
90	27.4	0	1	0	0	2	0	4	1	4	4	4	4	90	539.75
100	30.5	1	1	0	2	2	0	8	2	8	8	8	8	100	524.88
110	33.5	0 OR 0	2 OR 0	0 OR 1	0 OR 0	4 OR 0	0 OR 2	8 OR 4	2 OR 2	8 OR 4	8 OR 4	8 OR 4	8 OR 4	110	512.38
120	36.6	1 OR 1	2 OR 0	0 OR 1	2 OR 2	4 OR 0	0 OR 2	12 OR 8	3 OR 3	12 OR 8	12 OR 8	12 OR 8	12 OR 8	120	501.75
130	39.6	0	1	1	0	2	2	8	3	8	8	8	8	130	484.75
140	42.7	1	1	1	2	2	2	12	4	12	12	12	12	140	
150	45.7	0 OR 0	2 OR 0	1 OR 2	0 OR 0	4 OR 0	2 OR 4	12 OR 8	4 OR 4	12 OR 8	12 OR 8	12 OR 8	12 OR 8	150	471.88
160	48.8	1 OR 1	2 OR 0	1 OR 2	2 OR 2	4 OR 0	2 OR 4	16 OR 12	5 OR 5	16 OR 12	16 OR 12	16 OR 12	16 OR 12	160	
170	51.8	0	1	2	0	2	4	12	5	12	12	12	12	170	461.63
180	54.9	1	1	2	2	2	4	16	6	16	16	16	16	180	
190	57.9	0 OR 0	2 OR 0	2 OR 3	0 OR 0	4 OR 0	4 OR 6	16 OR 12	6 OR 6	16 OR 12	16 OR 12	16 OR 12	16 OR 12	190	450.13
200	61.0	1 OR 1	2 OR 0	2 OR 3	2 OR 2	4 OR 0	4 OR 6	20 OR 16	7 OR 7	20 OR 16	20 OR 16	20 OR 16	20 OR 16	200	
210	64.0	0	1	3	0	2	6	16	7	16	16	16	16	210	441.13
220	67.1	1	1	3	2	2	6	20	8	20	20	20	20	220	
230	70.1	0 OR 0	2 OR 0	3 OR 4	0 OR 0	4 OR 0	6 OR 8	20 OR 16	8 OR 8	20 OR 16	20 OR 16	20 OR 16	20 OR 16	230	240
240	73.2	1 OR 1	2 OR 0	3 OR 4	2 OR 2	4 OR 0	6 OR 8	24 OR 20	9 OR 9	24 OR 20	24 OR 20	24 OR 20	24 OR 20	240	

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LUFFING JIB RIGGING

#44 Luffing Jib on #55/79A Boom with 100' Mast

ITEM	PART #	QTY.	DESCRIPTION OF PART
1	78292	2	PIN
2	137502	as req.	WASHER
3	160720	2	PIN
4	172298	4	PIN
5	172960	1	LUFFING JIB LOWER POINT ROLLER ASSEMBLY
6	174211	1	LUFFING JIB UPPER POINT ROLLER ASSEMBLY
7	178905	2	TIMBER
8	179840	2	STRAP
9	179862	4	COLLAR
10	179863	4	PIN
11	179915	1	TOP, 30' Boom/Jib (9.14 m) (see O-539)
12	179959	4	PIN
13	195197	2	SHAFT
14	195198	4	PLATE, Keeper
15	195204	2	SHAFT
16	195208	2	PIN
17	195209	1	JIB STOP ASSEMBLY
18	195666	2	PIN
19	A00228	2	SUPPORT, Jib Strut
20	A02735	2	SIGN, Boom
21	A04331	1	LUFFING JIB HOIST ASSEMBLY
22	A05312	1	ROLLER ASSEMBLY (see Note 1)
JIB BUTT MOD. (1 PIECE)			
23	171230	1	BUTT, #44 BOOM/JIB 40' (see Note 2) (see O-539)
JIB BUTT MOD. (2 PIECE)			
24	171283	1	BUTT, #44 Boom Lower Section (40') (see Note 2) (see O-539)
25	171284	1	BUTT, #44 Boom Upper Section (40') (see O-539)
ADAPTER FRAME, #79A BOOM			
26	A07488	1	ADAPTER FRAME ASSEMBLY
R1	171825	6	PLATE, Keeper (3/4" thick)
R2	194986	6	PIN, Keeper (5" dia. x 10-7/8" long)
R3	396319	2	PIN, Dowel Roll (1/8" x 5/8" long)
R4	429010	6	FITTING, Grease
R5	562176	8	PIN, Cotter (1/2" x 9" long)
R6	612721	12	SCREW, Hex Cap (3/4-10 x 2-1/4" long, grade 5)
R7	710308	12	WASHER, Lock (3/4")
R8	A06896	1	ADAPTER FRAME, #79A Boom (machining)
R9	A07485	4	PIN, Cotter (5-1/32" dia. x 12-3/8" long)
R10	A07600	6	BAR, Square (3/4" CF 1018)
R11	A07623	1	BRACKET, Limit Switch
#44 INSERT, 10' (3.1 M)			
1	78292	4	PIN
7	178905	1	TIMBER
27	179837	2	STRAP, Boom Support (10')
28	192250	4	LINK, Boom Support

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MODEL	18000		
LUFFING JIB RIGGING #44 Luffing Jib on #55/79A Boom with 100' Mast			
ITEM	PART #	QTY.	DESCRIPTION OF PART
9	179862	4	COLLAR
10	179863	4	PIN
29	179912	1	INSERT, 10' (3.05 m) (see O-539)
12	179959	4	PIN
#44 INSERT, 20' (6.1 M)			
1	78292	4	PIN
7	178905	1	TIMBER
30	179838	2	STRAP, Boom Support (20')
28	192250	4	LINK, Boom Support
9	179862	4	COLLAR
10	179863	4	PIN
31	179913	1	INSERT, 20' (6.10 m) (see O-539)
12	179959	4	PIN
#44 INSERT, 40' (12.2 M)			
1	78292	4	PIN
7	178905	2	TIMBER
32	179839	2	STRAP, Boom Support (40')
28	192250	4	LINK, Boom Support
9	179862	4	COLLAR
10	179863	4	PIN
33	179914	1	INSERT, 40' (12.19 m) (see O-539)
12	179959	4	PIN
JIB STRUT			
34	194160	1	JIB STRUT ASSEMBLY
R12	144435	4	WASHER, Flat (see Note 3)
R13	168779	1	BOOM ANGLE INDICATOR ASSEMBLY
R14	169810	2	PLATE, Keeper
R15	171250	2	SHEAVE ASSEMBLY (see Note 4)
R16	171964	7	SHEAVE ASSEMBLY (see Note 5)
R17	174149	2	PIN
R18	178460	2	COLLAR
R19	179862	2	COLLAR
R20	179863	2	PIN
R21	179959	2	PIN
R22	194159	1	WELDMENT, Jib Strut (see O-539)
R23	194910	2	SPACER
R24	194915	1	SPACER
R25	194976	2	SPACER
R26	194977	1	SHAFT
R27	194978	1	SHAFT
R28	194979	2	LINK
R29	194980	2	PIN
R30	194981	2	PIN
R31	194982	4	STOP, Cylinder
R32	194985	8	PIN

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MODEL			
18000			
LUFFING JIB RIGGING			
#44 Luffing Jib on #55/79A Boom with 100' Mast			
ITEM	PART #	QTY.	DESCRIPTION OF PART
R33	194997	2	CABLE ASSEMBLY (60')
R34	195005	1	SPACER
R35	195006	1	GUARD, Rope
R36	195194	2	PIN
R37	195195	2	PLATE, Keeper
R38	225105	2	NUT, Bearing Lock (see Note 6)
R39	225111	1	WASHER, Bearing Lock
R40	546052	8	NUT, Hex (1/4-20)
R41	546054	6	NUT, Hex (3/8-16UNC)
R42	612451	6	SCREW, Cap (3/8-16UNC - 2B x 5/8" long)
R43	612353	8	SCREW, Hex Cap (1/4-20 x 3/4" long)
R44	614033	4	SCREW, Hex Cap (3/8-16 x 4" long)
R45	631528	4	ROLLER, Sheave (1/4" dia.) (see Note 7)
R46	709440	6	WASHER, Flat (3/8")
R47	710302	8	WASHER, Lock (1/4")
R48	710304	10	WASHER, Lock (3/8")
R49	A00070	2	ROLLER
R50	A00072	1	TUBE, Round
R51	A00306	2	HYDRAULIC CYLINDER ASSEMBLY
R52	A00355	2	WINCH
R53	A00874	4	SHIM, 3/32" (13 GA.)
R54	A01617	2	SUPPORT
R55	A01624	2	SHIM PACK
R56	A02831	2	SUPPORT, Keeper Plate
STRAP			
R57	194869	2	STRAP ASSEMBLY
R58	194861	2	STRAP, Adjustable Length Jib Weldment
R59	179862	2	COLLAR
R60	179959	2	PIN
R61	194864	2	LINK, Strap
R62	194865	2	EXTENSION, Strap
R63	194872	2	PIN, Strap Adjust
R64	194966	4	COLLAR
R65	194967	2	PIN
R66	194968	2	PIN
R67	194992	2	PIN
R68	195350	2	HANDLE
MAIN STRUT			
35	194162	1	MAIN STRUT ASSEMBLY
R69	139133	2	PIN
R70	169810	1	PLATE, Keeper
R71	171964	7	SHEAVE ASSEMBLY (see Note 5)
R72	179862	2	COLLAR
R73	179863	2	PIN
R74	179959	2	PIN

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MODEL	18000		
LUFFING JIB RIGGING #44 Luffing Jib on #55/79A Boom with 100' Mast			
ITEM	PART #	QTY.	DESCRIPTION OF PART
R75	194161	1	MAIN STRUT, Weldment (see O-539)
R76	194682	2	PIN
R77	194683	2	COLLAR
R78	194684	2	PIN
R79	194880	1	SHAFT
R80	194907	1	LINK ASSEMBLY
R81	194908	1	SPACER
R82	194909	2	SPACER
R83	194910	1	SPACER
R84	194911	1	SHAFT
R85	194914	2	PIN
R86	194979	2	LINK
R87	194987	2	ROLLER
R88	194988	1	ROLLER
R89	194993	2	STRAP
R90	194994	10	PIN
R91	195004	1	SPACER
R92	225105	2	NUT, Bearing Lock (see Note 6)
R93	225111	1	WASHER, Bearing Lock
R94	276935	2	PENDANT
R95	624779	2	PIN, Shackle (2-1/4" dia.)
R96	646246	1	WEDGE, Socket (1" Wire Rope) (see O-890)
OPTIONAL WIRE ROPE GUARD FOR CE CODE			
36	A06120	1	GUARD, Wire Rope for CE Code
BOOM RIGGING (A05379)			
R97	A04342	1	MAST ASSEMBLY (100')
EQUALIZER			
R98	A06258	1	EQUALIZER ASSEMBLY
BUTT, 20' (6.10 M) #55 BOOM			
R99	A05403	1	20' BUTT ASSEMBLY, #55 Boom
R100	A05447	1	BUTT, , 20' (machining) (see O-573)
R101	A04989	2	BOOM STOP ASSEMBLY
R102	A04329	1	DRUM ASSEMBLY, Main Hoist
R103	193481	1	PIN PULLER ASSEMBLY
R104	A06649	2	PIN, Upper Male Connector
R105	168179	1	INDICATOR, Boom Angle
Luffing Jib Equipped (see Note 8)			
37	A04331	1	LUFFING DRUM ASSEMBLY
38	A07498	2	LINK, #55 Boom Strap
39	A07517	2	PIN, 1 Hole w/Hd
40	A06344	2	PAWL ASSEMBLY, Luffing Drum
41	A06150	2	PIN, 2 Hole
42	A06151	2	COLLAR
43	562105	4	PIN, Cotter (1/4" x 1-1/2" long)

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MODEL 18000			
LUFFING JIB RIGGING #44 Luffing Jib on #55/79A Boom with 100' Mast			
ITEM	PART #	QTY.	DESCRIPTION OF PART
INSERT, 10' (3.05 M) #55 BOOM			
R106	A05381	1	INSERT ASSEMBLY, 10' (#55 Boom)
R107	A05448		INSERT, 10' (machining)(see O-573)
R108	A04329	1	DRUM ASSEMBLY, Main Hoist
R109	631099	2	SHEAVE
R110	563640	4	PIN, Safety
R111	A07561	2	PIN, 1 Hole w/Hd
R112	A06099	2	PIN, 1 Hole w/Hd
R113	A06649	2	PIN, Upper Male Connector Locking
R114	A06173	1	FRAME, Drum/Sheave (machining)
R115	A06175	2	SHAFT
R116	A06176	2	GUARD, Rope
R117	A06540	4	PIN, Frame
R118	A06361	2	PENDANT
Luffing Jib Equipped (see Note 8)			
44	562045	4	PIN, Cotter (1/8" x 1-1/2" long)
45	562105	8	PIN, Cotter (1/8" x 1-1/2" long)
46	A05198	2	STRAP, 10' (2" x 3-3/4") (#55 Boom)
47	A06149	4	PIN, 1 Hole w/Hd
48	A06150	4	PIN, 2 Hole
49	A06151	4	COLLAR
50	A06457	4	LINK, #55 Boom
51	A07565	2	PIN, 2 Hole (5/8" dia. x 9-7/8" long)
INSERT, 40' (12.19 M) #55 BOOM			
R119	A05387	1	INSERT ASSEMBLY, 40' (#55 Boom) (see Note 9)
R120	A05451	1	INSERT, 40' (machining) (see O-573)
R121	194123	2	TIMBER
R132	A07561	2	PIN, 1 Hole w/Hd
R123	A06099	2	PIN, 1 Hole w/Hd
R124	A06649	2	PIN, Upper Male Connector Locking
R125	548342	8	NUT, Lock NE (3/8-16)
R126	563640	2	PIN, Safety (1/4" O.D. x 5" long)
R127	612480	8	SCREW, Hex Cap (3/8-16 x 4-1/2" long, grade 5)
R128	709703	16	WASHER, Flat (1/32")
Luffing Jib Equipped (see Note 8)			
52	171497	2	PLATE, End
53	172169	1	SHEAVE (24" dia.)
54	563803	4	PIN, Snap (3/8" x 2-1/4" long)
55	612657	4	SCREW, Hex Cap (5/8-11 x 1" long, grade 5)
56	710307	4	WASHER, Lock (5/8")
57	A06399	1	WIRE ROPE GUARD ASSEMBLY, Luffing Line
58	A06586	2	GUARD, Wire Rope
59	A06659	1	SHAFT (4-1/2" O.D. x 9-15/32" long)
60	562045	8	PIN, Cotter (1/8" x 1-1/2" long)
61	532105	8	PIN, Cotter (1/4" x 1-1/2" long)

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MODEL	18000		
LUFFING JIB RIGGING #44 Luffing Jib on #55/79A Boom with 100' Mast			
ITEM	PART #	QTY.	DESCRIPTION OF PART
62	A05197	2	STRAP, 40' (2" x 3-3/4") (#55 Boom)
63	A06149	4	PIN, 1 Hole w/Hd
64	A06150	4	PIN, 2 Hole
65	A06151	4	COLLAR
66	A06457	4	LINK, #55 Boom
67	A07033	2	PIN, 2 Hole (5/8" dia. x 6-3/4" long)
68	A07034	2	PIN, 2 Hole (5/8" dia. x 6" long)
INSERT, 20' (6.10 M) #55 BOOM			
R129	A05383	1	INSERT ASSEMBLY,20' (#55 Boom)
R130	A05449	1	INSERT, 20' (machining) (see O-573)
R131	A06651	4	ROLLER
R132	A06653	4	PIN, Roller
R133	194123	2	TIMBER
R134	A07561	2	PIN, 1 Hole w/Hd
R135	A06099	2	PIN, 1 Hole w/Hd
R136	563640	2	PIN, Safety
Luffing Jib Equipped (see Note 8)			
69	562045	8	PIN, Cotter (1/8" x 1-1/2" long)
70	562105	8	PIN, Cotter (1/4" x 1-1/2" long)
71	A05196	2	STRAP, 20' (#55 Boom) (2" x 3-3/4")
72	A06149	4	PIN, 1 Hole w/Hd
73	A06150	4	PIN, 2 Hole
74	A06151	4	COLLAR
75	A06457	4	LINK, #55 Boom
76	A07033	2	PIN, 2 Hole (5/8" dia. x 6-3/4" long)
77	A07034	2	PIN, 2 Hole (5/8" dia. x 6" long)
TRANSITION INSERT, 40' (12.19 M)			
R137	A05400	1	TRANSITION INSERT ASSEMBLY, 40'
R138	A05459	1	TRANSITION INSERT, 40' (machining)(see O-573)
R139	170799	2	PIN
R140	179862	2	COLLAR (3" dia. x 1" long)
R141	179959	2	PIN (1/2" dia. x 4-1/8" long)
R142	194123	2	TIMBER
R143	562043	4	PIN, Cotter (1/8" x 1" long)
R144	562085	4	PIN, Cotter (3/16" x 1-1/2" long)
R146	A06099	2	PIN, 1 Hole w/Hd
R147	A06683	4	LINK, Eq to #79 Boom Strap
R148	A06944	2	PIN, 1 Hole w/Hd (2-1/4" dia. x 6-9/32" long)
R149	A06947	2	PIN, 1 Hole w/Hd (4-1/2" dia. x 6-9/32" long)
R150	A07161	2	COLLAR (6" dia. x 1-3/4" long)
R151	A07561	2	PIN, 1 Hole w/Hd
Luffing Jib Equipped (see Note 8)			
78	78292	4	PIN
79	179862	2	COLLAR (3" dia. x 1" long)
80	179863	2	PIN, 1 Hole w/Hd (2-1/4" dia. x 4-1/2" long)

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MODEL

18000

LUFFING JIB RIGGING

#44 Luffing Jib on #55/79A Boom with 100' Mast

ITEM	PART #	QTY.	DESCRIPTION OF PART
81	179959	2	PIN (1/2" dia. x 4-1/8" long)
82	562045	8	PIN, Cotter (1/8" x 1-1/2" long)
83	562085	4	PIN, Cotter (3/16" x 1-1/2" long)
84	562105	4	PIN, Cotter (1/4" x 1-1/2" long)
85	A06149	2	PIN, 1 Hole w/Hd
86	A06150	2	PIN, 2 Hole
87	A06151	2	COLLAR
88	A07111	2	STRAP, 55/79 Transition
89	A07112	4	LINK, 55/79 Transition
INSERT, 20' (6.10 M) #79 BOOM			
R152	194086	1	INSERT ASSEMBLY, 20' (#79 Boom)
R153	193412	1	INSERT, 20' (see O-562)
R154	193888	2	PIN
R155	193889	2	PIN
R156	193886	2	PIN
R157	179838	2	STRAP
R158	192250	4	LINK, Strap
R159	179863	4	PIN, Strap
R160	78292	4	PIN, Strap Bracket
R161	179862	4	COLLAR
R162	194123	2	TIMBER
R163	179959	4	PIN
R164	194377	4	ROLLER
R165	194378	4	PIN
Luffing Jib Equipped (see Note 8)			
90	179838	2	STRAP
91	192250	4	LINK, Strap
92	179863	4	PIN, Strap
93	78292	4	PIN, Strap Bracket
94	179862	4	COLLAR
95	179959	4	PIN
INSERT, 40' (12.19 M) #79 BOOM			
R166	194087	1	INSERT ASSEMBLY, 40' (#79 Boom)
R167	193413	1	INSERT, 40" (see O-562)
R168	193888	2	PIN
R169	193889	2	PIN
R170	193886	2	PIN
R171	179839	2	STRAP
R172	192250	4	LINK, Strap
R173	179863	4	PIN, Strap
R174	78292	4	PIN, Strap Bracket
R175	179862	4	COLLAR
R176	194123	2	TIMBER
R177	179959	4	PIN
R178	194377	4	ROLLER

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MODEL 18000			
LUFFING JIB RIGGING #44 Luffing Jib on #55/79A Boom with 100' Mast			
ITEM	PART #	QTY.	DESCRIPTION OF PART
R179	194378	4	PIN
	Luffing Jib Equipped (see Note 8)		
96	179839	2	STRAP
97	192250	4	LINK, Strap
98	179863	4	PIN, Strap
99	78292	4	PIN, Strap Bracket
100	179862	4	COLLAR
101	179959	4	PIN
TOP, #79A BOOM			
R180	A05401	1	BOOM TOP ASSEMBLY, #79A
R181	A05460	1	TOP, Boom (machining)(see O-562)
R182	78292	2	PIN
R183	179862	4	COLLAR (3" dia. x 1" long)
R184	179863	4	PIN, 1 Hole w/Hd (2-1/4" dia. x 4-1/2" long)
R185	179959	4	PIN (1/2" dia. x 4-1/8" long)
R186	193888	2	PIN
R187	193889	2	PIN
R188	194123	1	TIMBER (3-1/2" x 3-1/2")
R189	548342	4	NUT, Lock NE (3/8-16)
R190	562085	8	PIN, Cotter (3/16" x 1-1/2" long)
R191	562106	4	PIN, Cotter (1/4" x 1-3/4" long)
R192	563640	2	PIN, Safety (1/4" O.D. x 5" long)
R193	612480	4	SCREW, Hex Cap (3/8-16 x 4-1/2" long, grade 5)
R194	709703	8	WASHER, Flat (3/8")
R195	A05882	1	GUIDE ASSEMBLY, Wire Rope
R196	A06074	1	BOOM POINT ASSEMBLY
R197	A06149	2	PIN, 1 Hole w/Hd
R198	A06150	2	PIN, 2 Hole
R199	A06151	2	COLLAR
R200	A06348	2	STRAP (28' 2-15/16")
R201	A06349	4	LINK (10")
R202	254555	20	SCREW, Machine (5/16-18 x 1-1/4" long, ZC Steel)
R203	546053	20	NUT, Hex (5/16-18 ZC)
R204	562045	4	PIN, Cotter (1/8" x 1-1/2" long)
R205	710303	20	WASHER, Lock (5/16")
R206	A02735	2	SIGN, Boom Manitowoc (37" x 96")
OPTIONAL PARTS			
102	A07773		500T HOOK ASSEMBLY (see O-1209)
103	A07752		450T HOOK ASSEMBLY (see O-1208)
104	237074		250MT HOOK ASSEMBLY (see O-1224)
105	236505		100T HOOK ASSEMBLY (see O-1225)
106	A00816		SWIVEL HOOK ASSEMBLY, 30T
107	A14753		250 M Tonne Hook Assembly (O-1409)

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MODEL 18000			
LUFFING JIB RIGGING #44 Luffing Jib on #55/79A Boom with 100' Mast			
ITEM	PART #	QTY.	DESCRIPTION OF PART
			<p>Note 1: If boom top does not have lugs to support roller assembly A05312 (item 22), use roller assembly A00678 in place of A05312.</p> <p>Note 2: #44 2-piece butt requires modification 417346. #44 1-piece butt requires modification 417345.</p> <p>Note 3: Shim cylinder lugs to center cylinder rod end on boom top cylinder guides.</p> <p>Note 4: 28 mm wire rope.</p> <p>Note 5: 1" wire rope.</p> <p>Note 6: Tighten locknuts efficiently to clamp bearing inner race.</p> <p>Note 7: For 1/4" wire rope.</p> <p>Note 8: Items required for adding luffing jib to existing equipment or use same items from insert assemblies for machines with luffing jib equipped.</p> <p>Note 9: With wire rope guides for luffing jib.</p> <p>O-539, O-562, O-573, O-890, O-1208, O-1209, O-1224, O-1225, O-1409</p>

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Luffing Jib Raising Procedure

Luffing Jib No. 44 On Boom No. 55-79A with 100 Ft. Mast No. 56

18000

Recommended boom and luffing jib raising and lowering procedure.

Machine must be equipped with 528,000 Lb. (239 500 kg) crane counterweight and 320,000 Lb. (145 150 kg) carbody counterweight. Refer to luffing jib rigging assembly **No. A07766** for boom and luffing jib make-up of inserts, straps, struts and strut raising procedure and miscellaneous parts, etc.

Two methods may be used to raise and lower boom and luffing jib combinations, depending on length.

A. Standard (In-Line) Method

Haul in luffing hoist line (luff up) until adjustable jib straps are raised to clear strap stowage brackets on luffing jib (approx. 50 to 68 degree jib strut to horizontal angle). Do not exceed 70 degree jib strut to horizontal angle. Check jib strut position by viewing angle indicator. Slowly raise boom to tighten luffing jib suspension while jib point rollers are allowed to roll on ground. After luffing jib suspension is tight, boom and luffing jib can then be raised simultaneously using only the boom hoist. Raise boom to 60 degrees or greater. If boom to luffing jib angle is more than 160 degrees, lower luffing jib to obtain this angle to allow jib stop to engage (see caution). Boom and luffing jib can then be set to desired operating angle and radius. Luffing jib radius must be within capacity chart before swinging over side of machine. Reverse this procedure when lowering boom and luffing jib.

CAUTION: Failure to lower luffing jib to 160 degree boom to luffing jib angle will not allow luffing jib stop to engage. Structural damage may result.

The following combinations may be raised and lowered using this method.

Maximum Boom And Luffing Jib Lengths Lifted Unassisted Using Standard (In-Line) Method					
Boom Length		Over End of Blocked Crawlers		Over Side of Crawlers	
		Luffing Jib No. 44		Luffing Jib No. 44	
Feet	Meters	Feet	Meters	Feet	Meters
140	42.7	70 - 240	21.3 - 73.2	70 - 240	21.3 - 73.2
160	48.8	70 - 240	21.3 - 73.2	70 - 240	21.3 - 73.2
180	54.9	70 - 210	21.3 - 64.0	70 - 210	21.3 - 64.0
200	61.0	70 - 180	21.3 - 54.9	70 - 170	21.3 - 51.8
220	67.1	70 - 150	21.3 - 45.7	70 - 120	21.3 - 36.6
240	73.2	70 - 110	21.3 - 33.5	70 - 80	21.3 - 24.4
Load blocks, hook and weight ball on ground until boom and luffing jib are erected.					

Luffing Jib Raising Procedure

Luffing Jib No. 44 On Boom No. 55-79A with 100 Ft. Mast No. 56

18000

B. Jack-Knife Method

Longer boom and luffing jib combinations must be raised and lowered using jack-knife method.

Haul in luffing hoist line (luff up) until adjustable jib straps are raised to clear strap stowage brackets on luffing jib (approx. 50 to 68 degree jib strut to horizontal angle). Do not exceed 70 degree jib strut to horizontal angle. Check jib strut position by viewing angle indicator. Slowly raise boom while jib point rollers are allowed to roll on ground. Tension should be applied to luffing jib hoist to keep adjustable jib straps off luffing jib during boom raising. Boom up until boom to luffing jib angle reaches value specified in table or jib is vertical, whichever occurs first. Tighten luffing jib suspension with luffing jib hoist. Boom and luffing jib are then raised together using boom hoist until boom reaches desired boom operating angle. Luffing jib radius must be within capacity chart before swinging over side of machine.

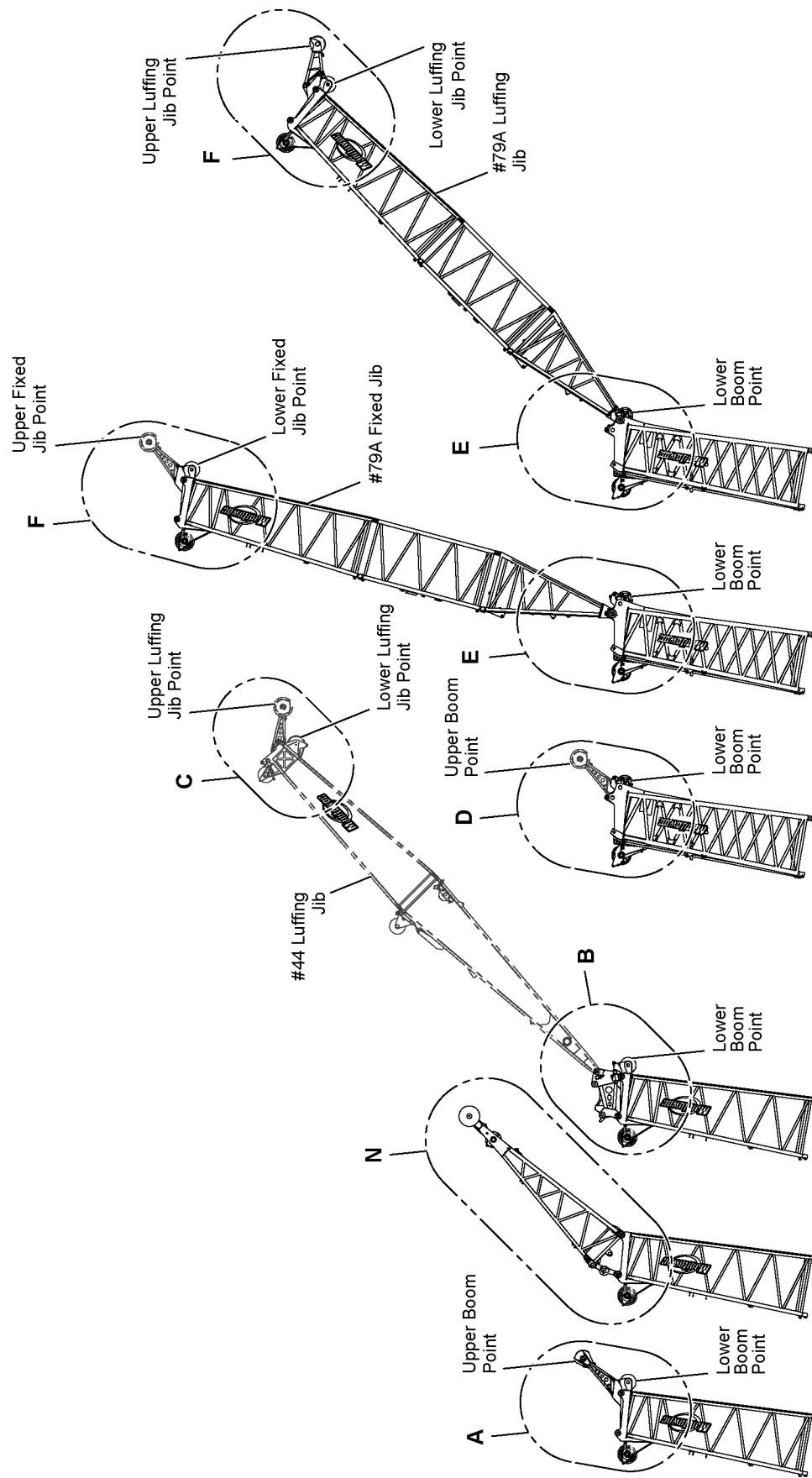
Position boom at 70 degrees or greater prior to lowering luffing jib. Lower luffing jib until boom to luffing jib angle reaches value specified in table. Lower boom until luffing jib point is just above ground. If luffing jib is hanging vertical, raise luffing jib a few degrees forward of vertical. Continue to lower boom while luffing jib rolls along ground. Keep enough tension on luffing jib hoist to keep adjustable jib straps off luffing jib and lower boom to ground.

CAUTION: Do not under any condition allow boom to luffing jib angle to become less than 70 degrees.

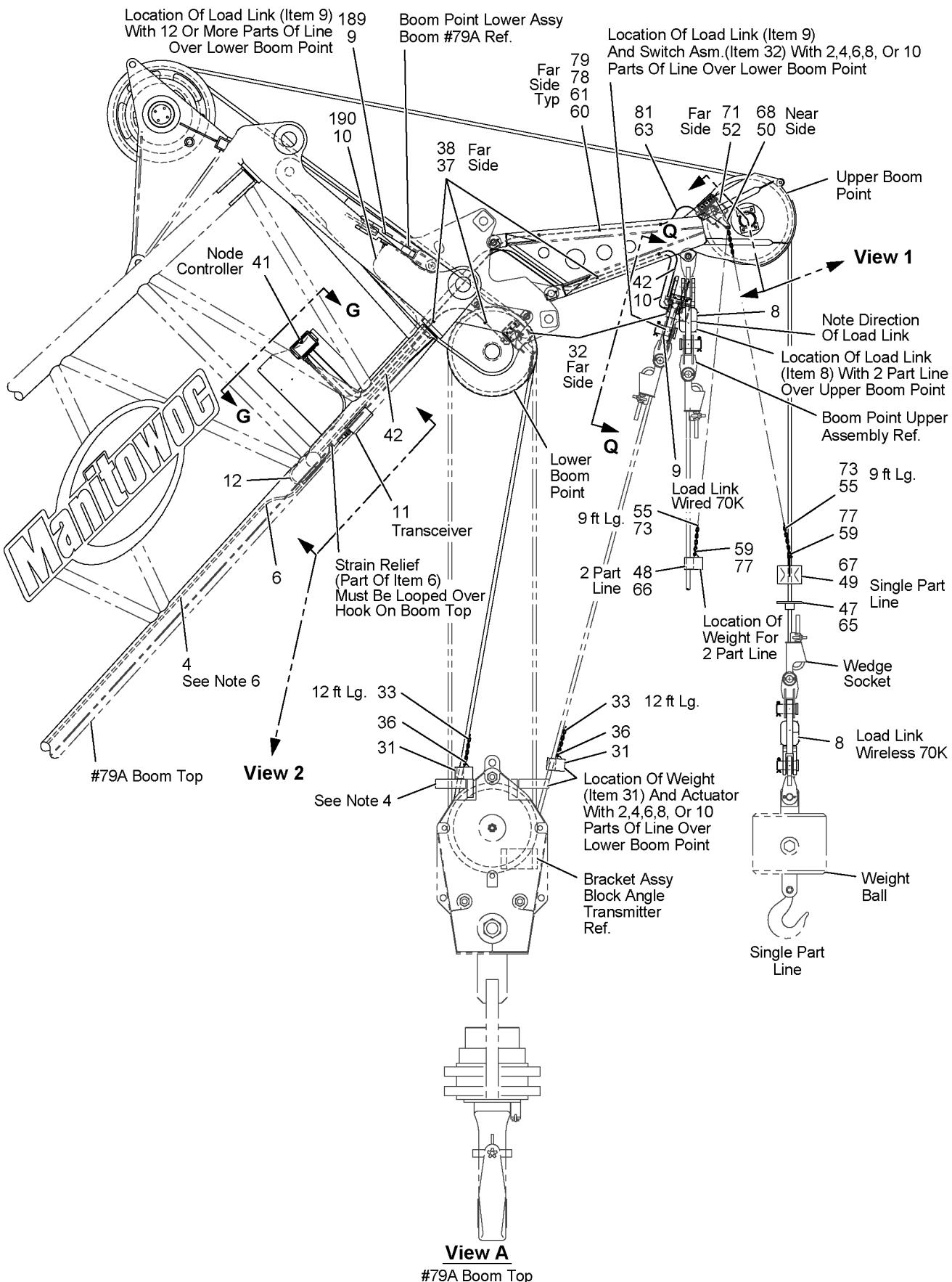
The following boom and luffing jib combinations require jack knifing to a specified boom to luffing jib angle for raising and lowering.

Maximum Boom And Luffing Jib Lengths Lifted Unassisted Using Jack-Knife Method							
Boom Length		Over End of Blocked Crawlers			Over Side of Crawlers		
		Luffing Jib No. 44		Boom to Luffing Jib Angle	Luffing Jib No. 44		Boom to Luffing Jib Angle
Feet	Meters	Feet	Meters	Degrees	Feet	Meters	Degrees
180	54.9	220 - 240	67.1 - 73.2	90	220 - 240	67.1 - 73.2	90
200	61.0	190 - 240	57.9 - 73.2	90	180 - 240	54.9 - 73.2	90
220	67.1	160 - 240	48.8 - 73.2	90	130 - 240	39.6 - 73.2	90
240	73.2	120 - 240	36.6 - 73.2	90	90 - 240	27.4 - 73.2	70
260	79.2	70 - 240	21.3 - 73.2	70			
280*	85.3	70 - 240	21.3 - 73.2	70			

Load blocks, hook and weight ball on ground until boom and luffing jib are erected.
 * Remove lower boom point.



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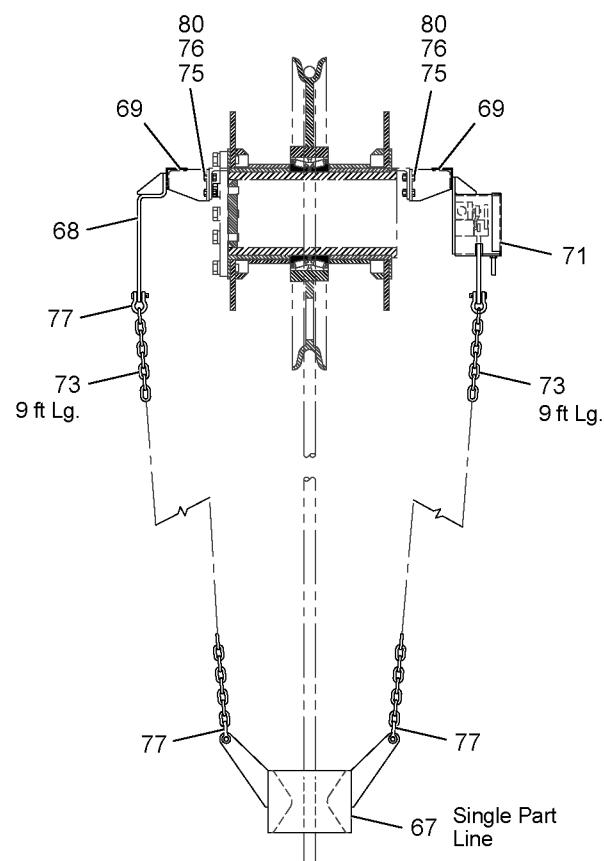
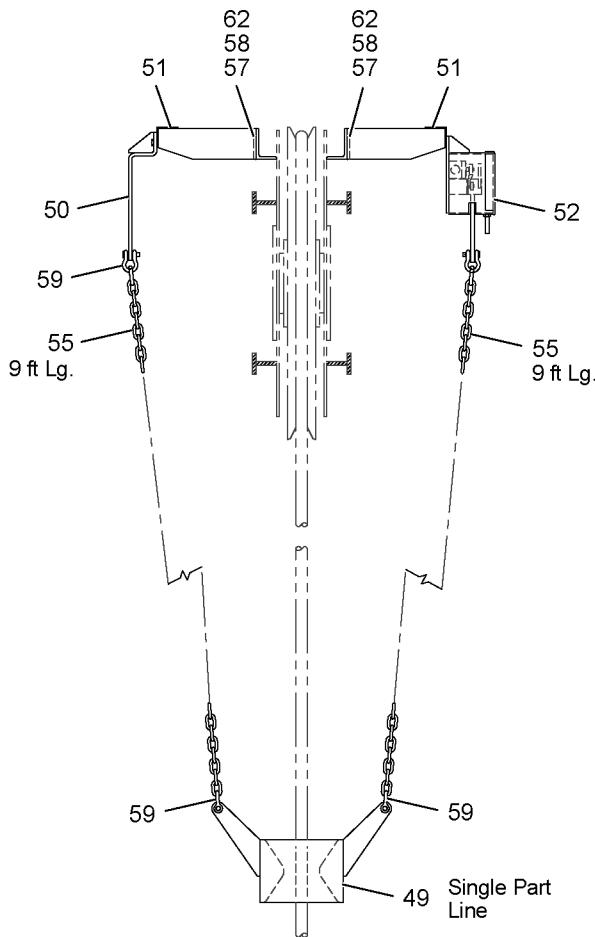


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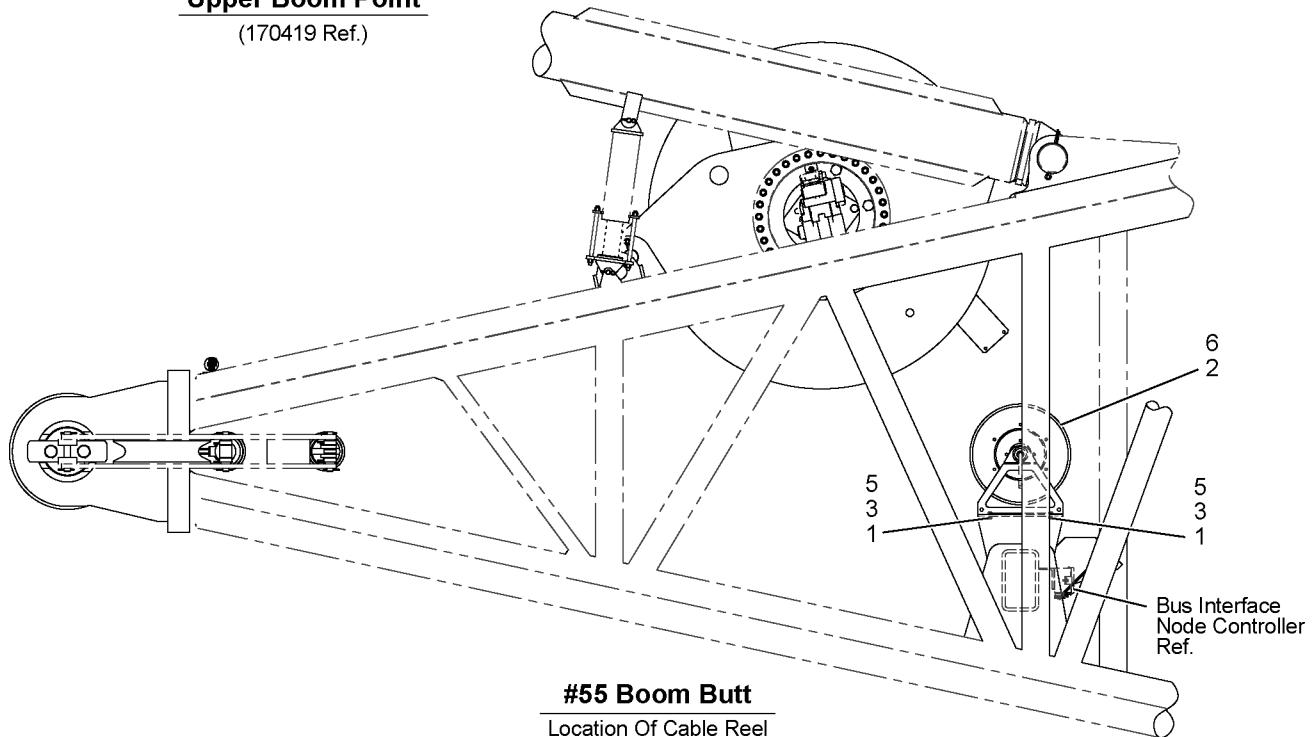


Upper Boom Point

(A08516 Ref.)

**View 1
Upper Boom Point**

(170419 Ref.)



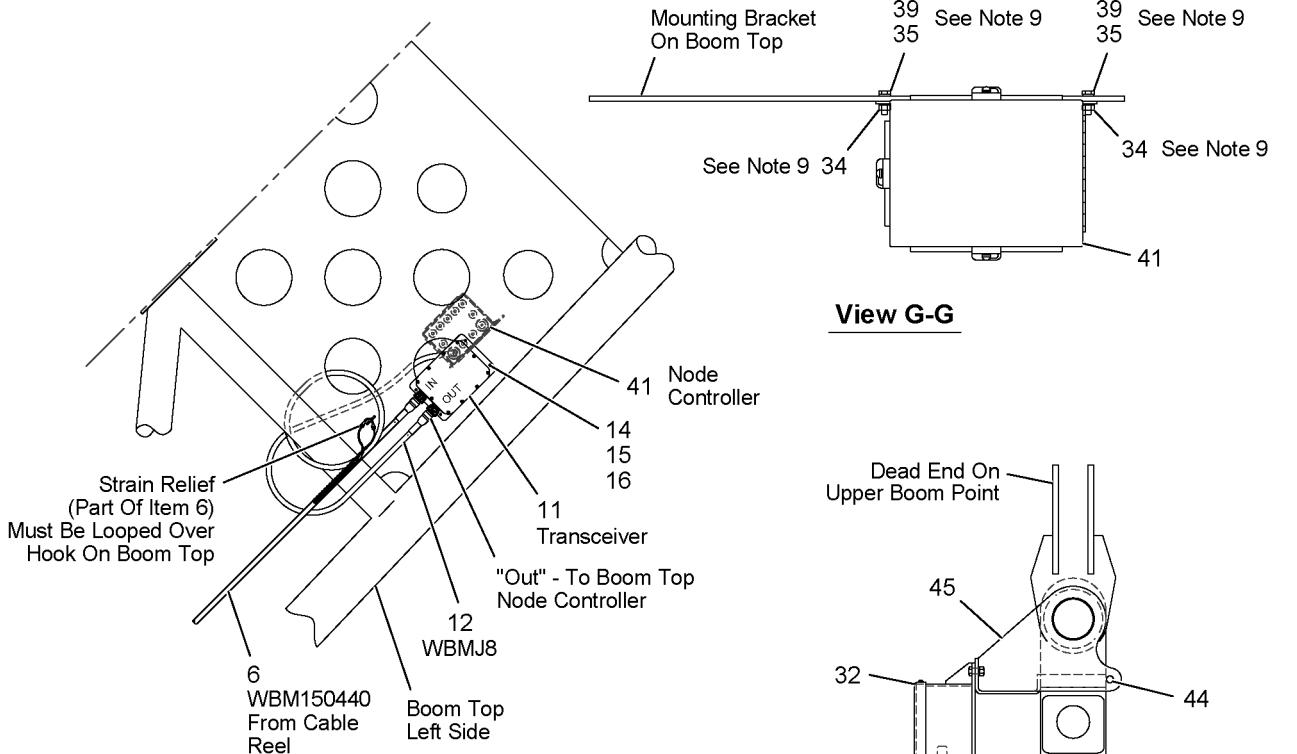
#55 Boom Butt

Location Of Cable Reel

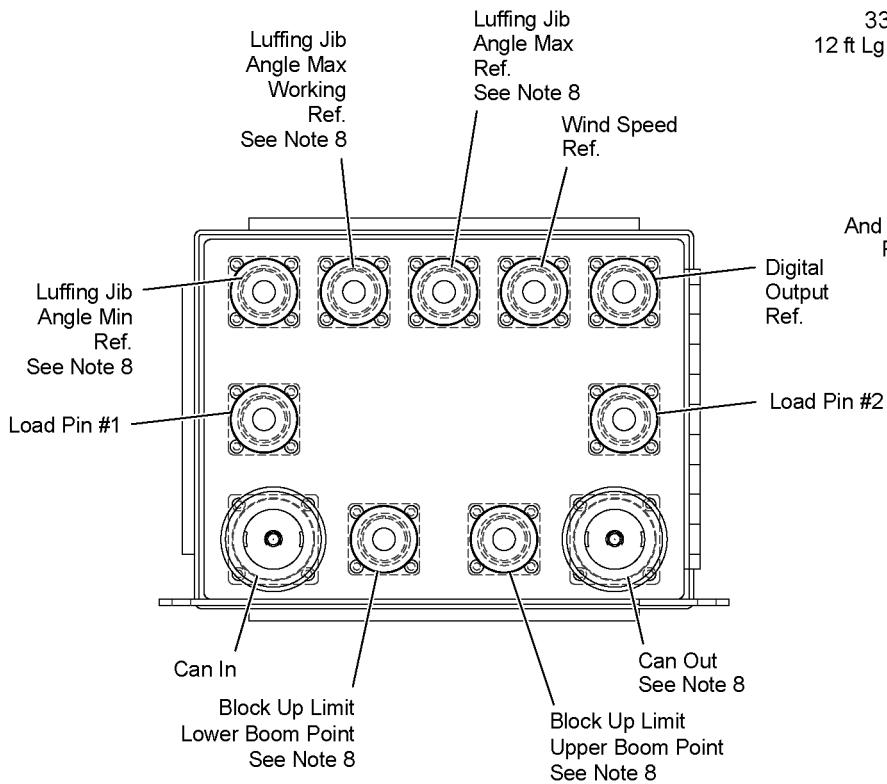
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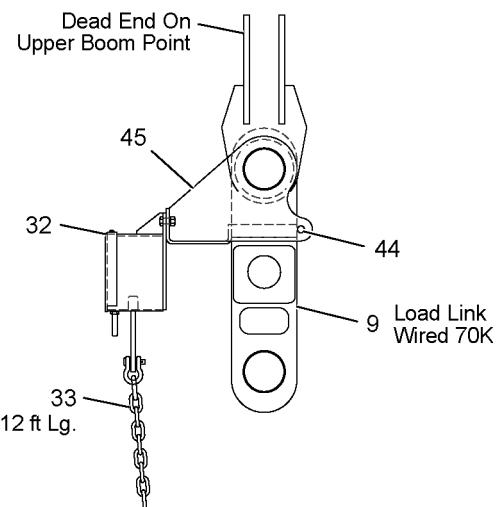


View 2



View Of Bottom Of Boom Node Controller

(Item 41)

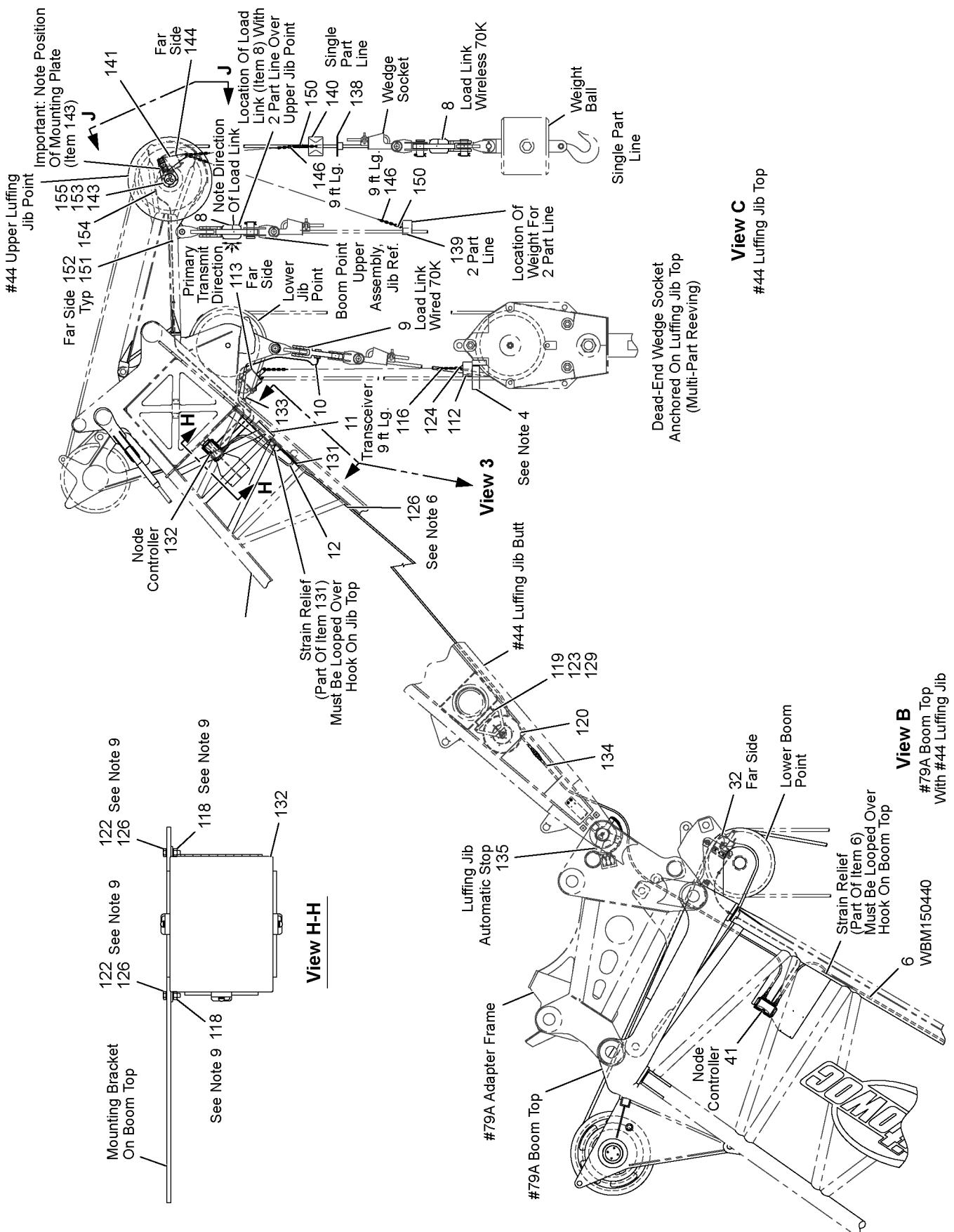


View Q-Q

Location Of Load Link (Item 9)
And Switch Asm.(Item 32) With 2,4,6,8, Or 10
Parts Of Line Over Lower Boom Point

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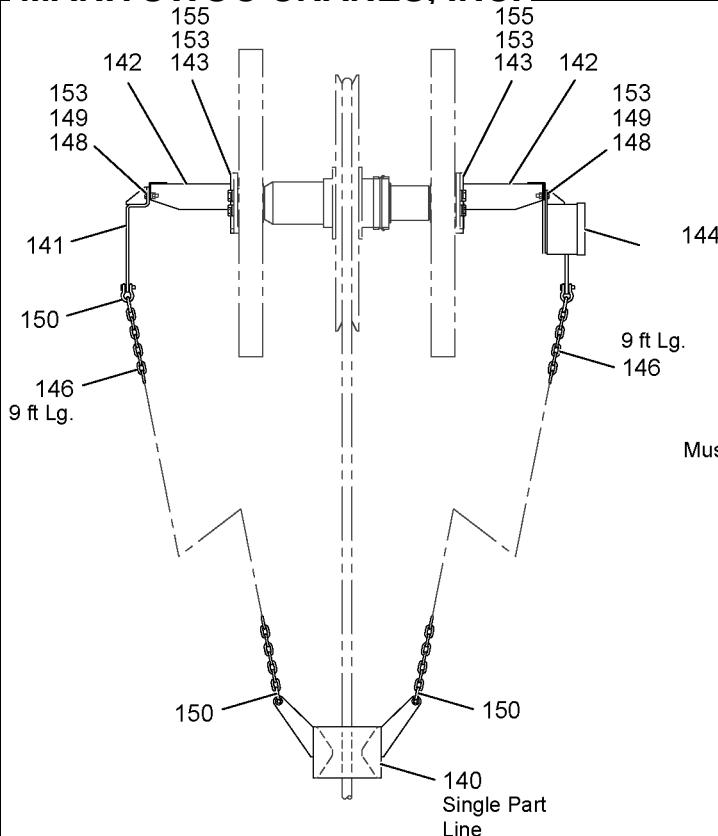
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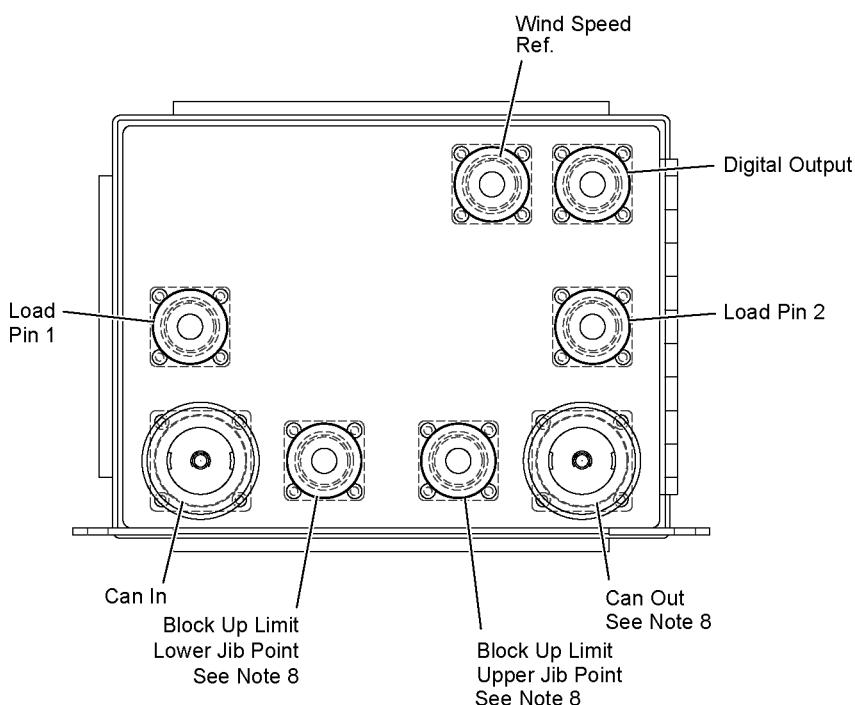
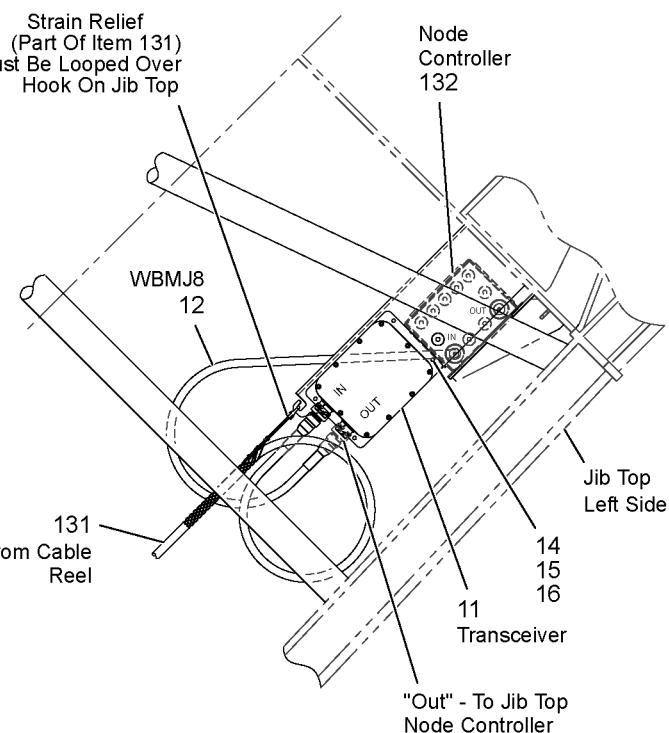
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View J-J
Upper Luffing Jib Point
(174211 Ref.)

Strain Relief
(Part Of Item 131)
Must Be Looped Over
Hook On Jib Top



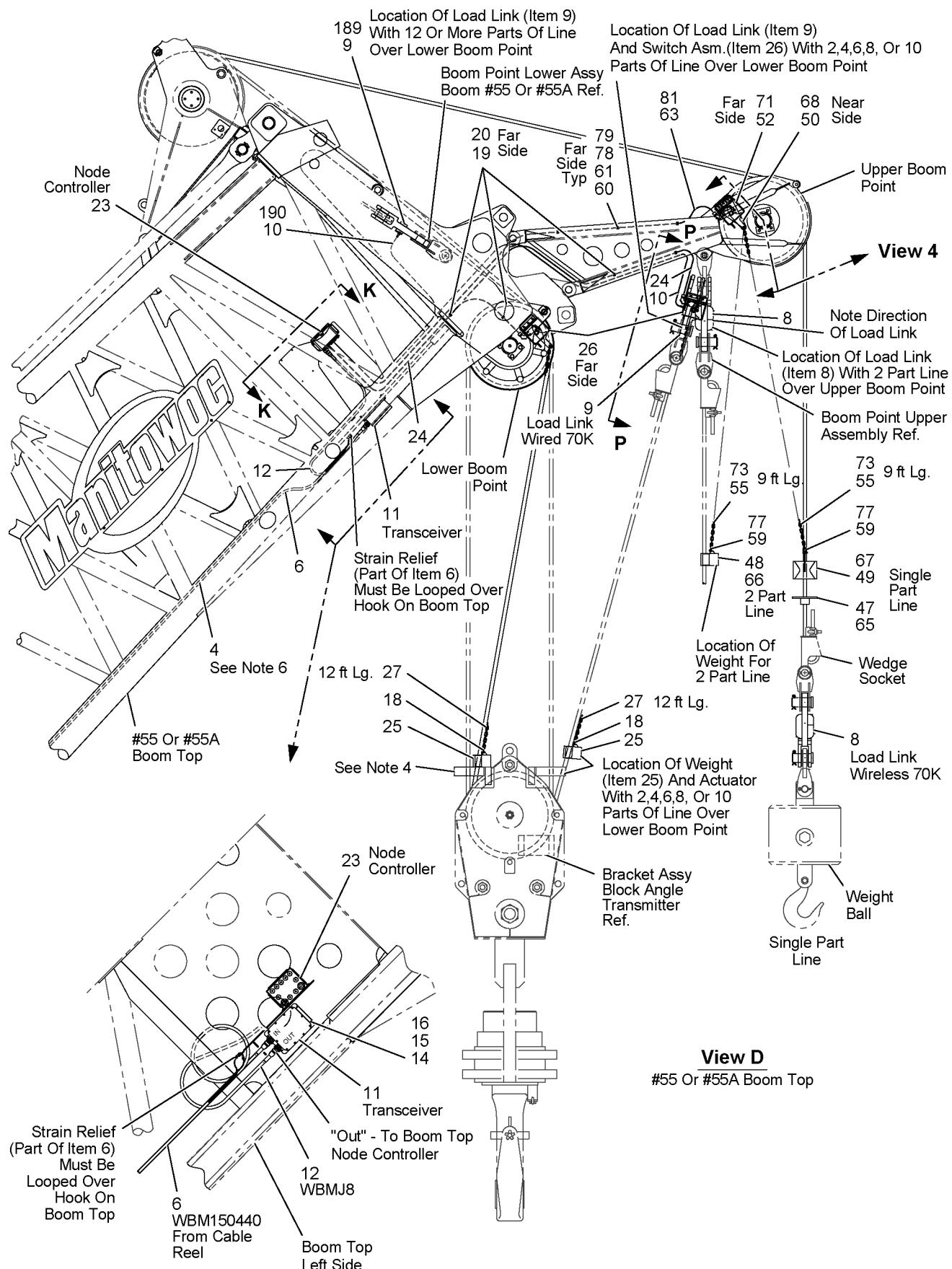
View 3

View Of Bottom Of Jib Node Controller

(Item 132)

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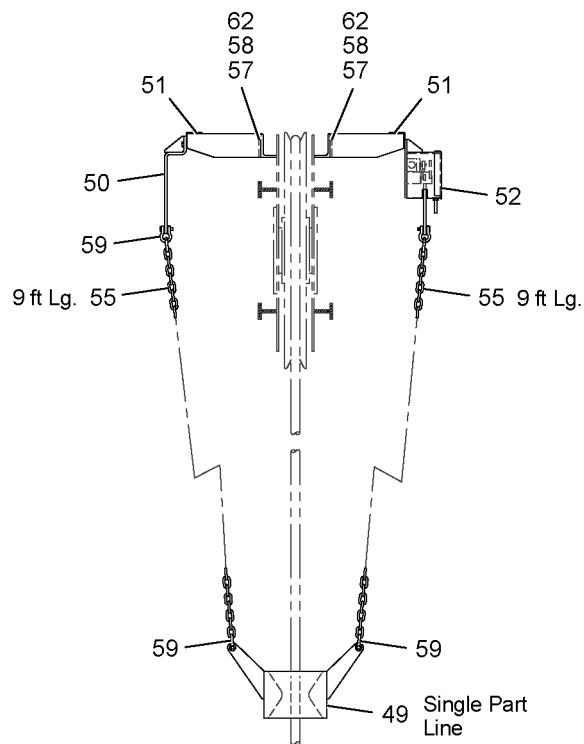
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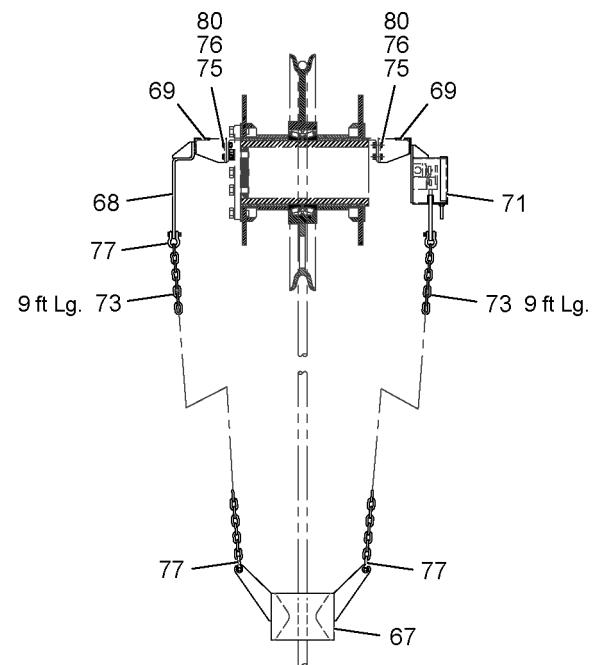
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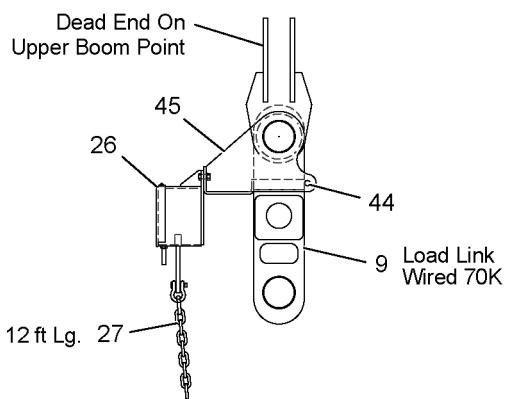
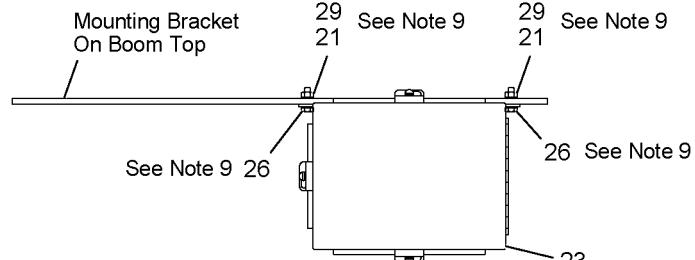
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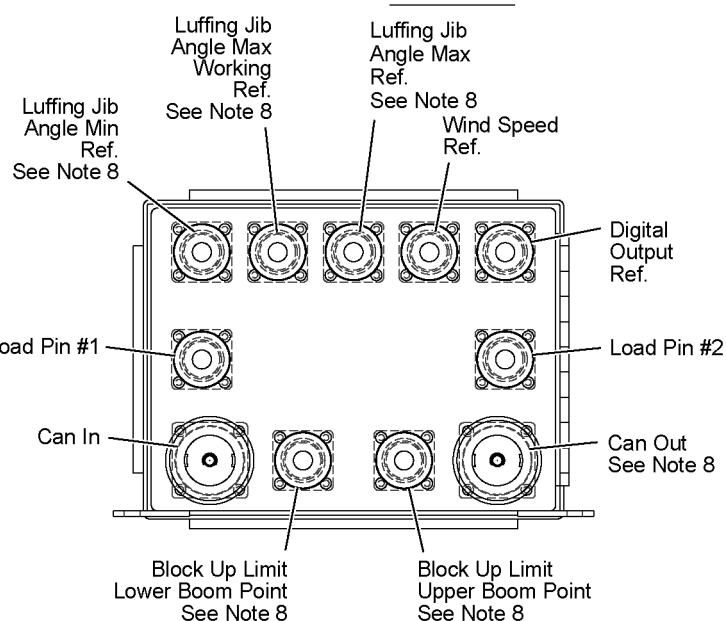
**View 4
Upper Boom Point**
(170419 Ref.)



Upper Boom Point
(A08516 Ref.)



View P-P
Location Of Load Link (Item 9)
And Switch Asm.(Item 26) With 2,4,6,8, Or 10
Parts Of Line Over Lower Boom Point



View Of Bottom Of Boom Node Controller

(Item 23)

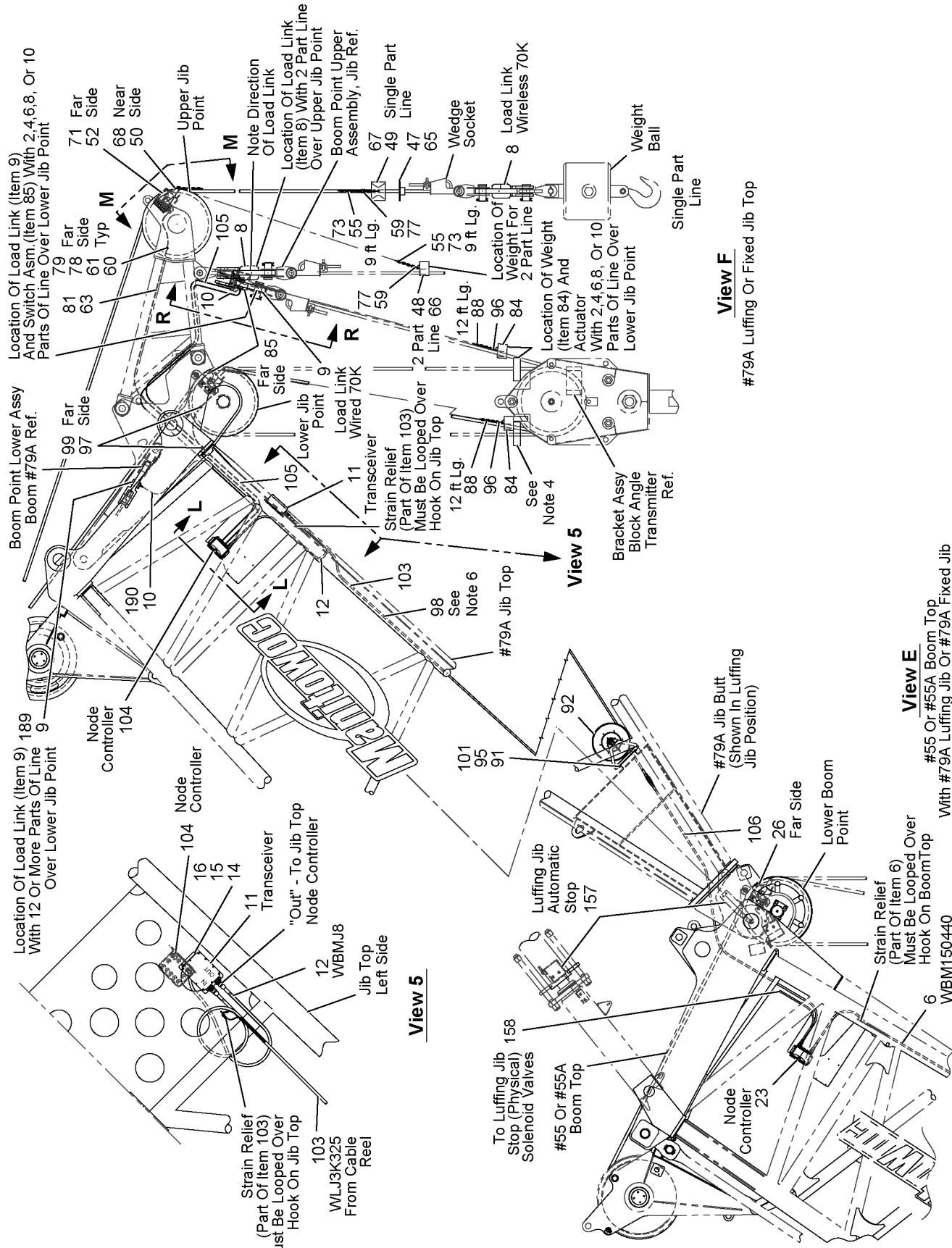
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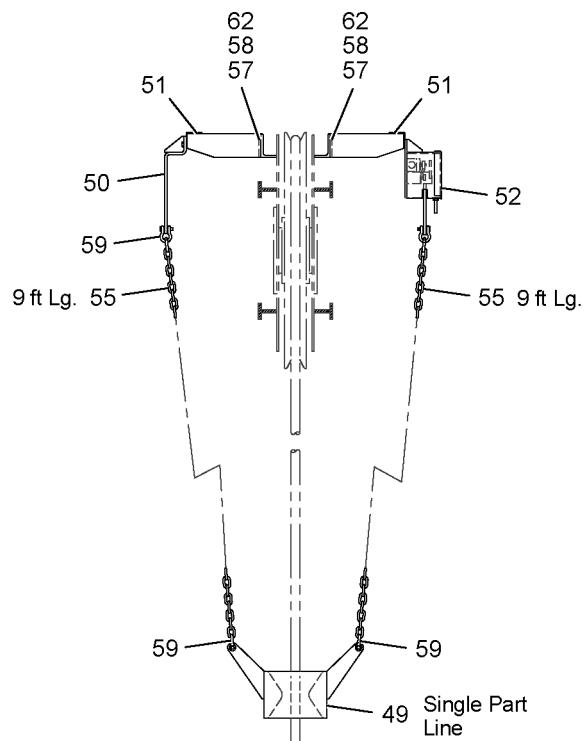
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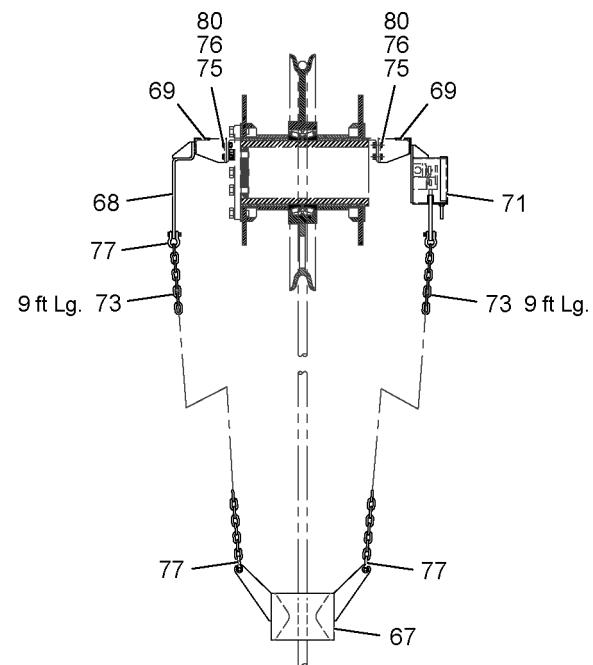
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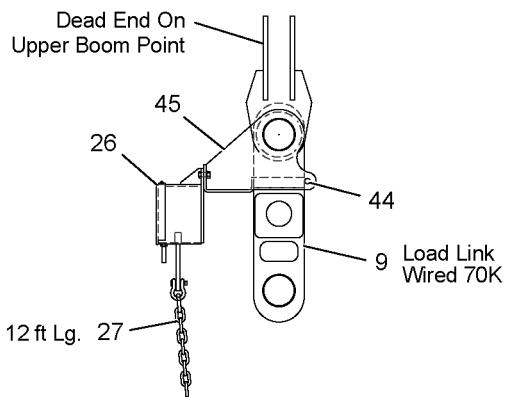
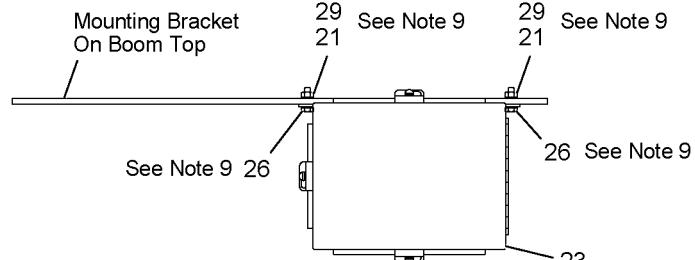
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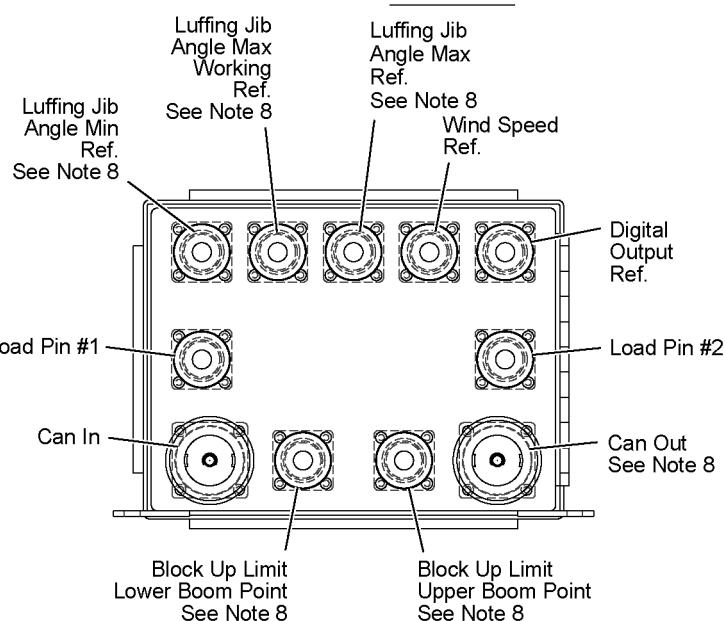
**View 4
Upper Boom Point**
(170419 Ref.)



Upper Boom Point
(A08516 Ref.)



View P-P
Location Of Load Link (Item 9)
And Switch Asm.(Item 26) With 2,4,6,8, Or 10
Parts Of Line Over Lower Boom Point



View Of Bottom Of Boom Node Controller

(Item 23)

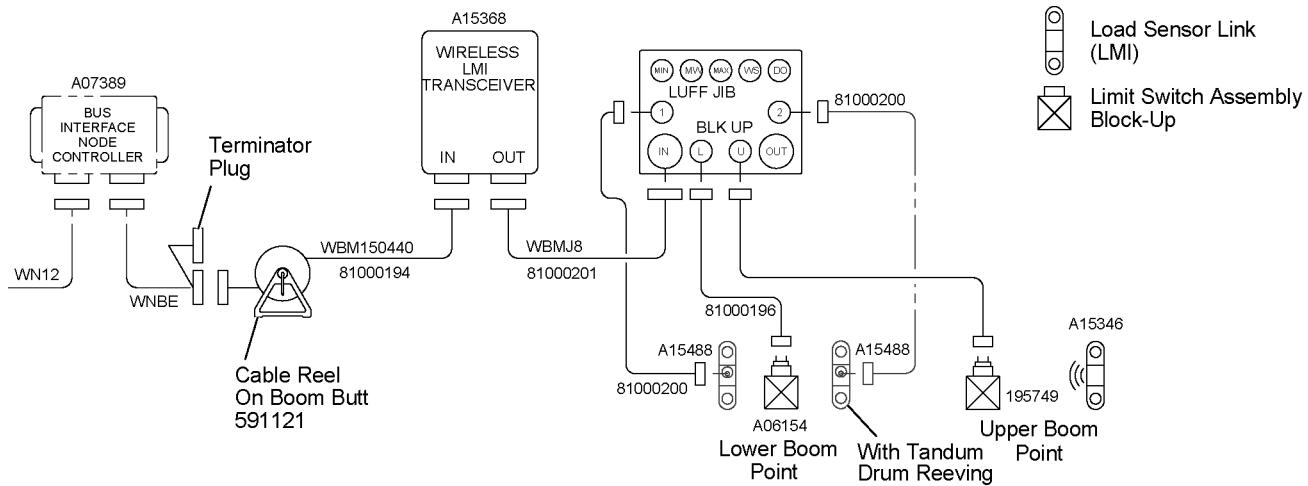
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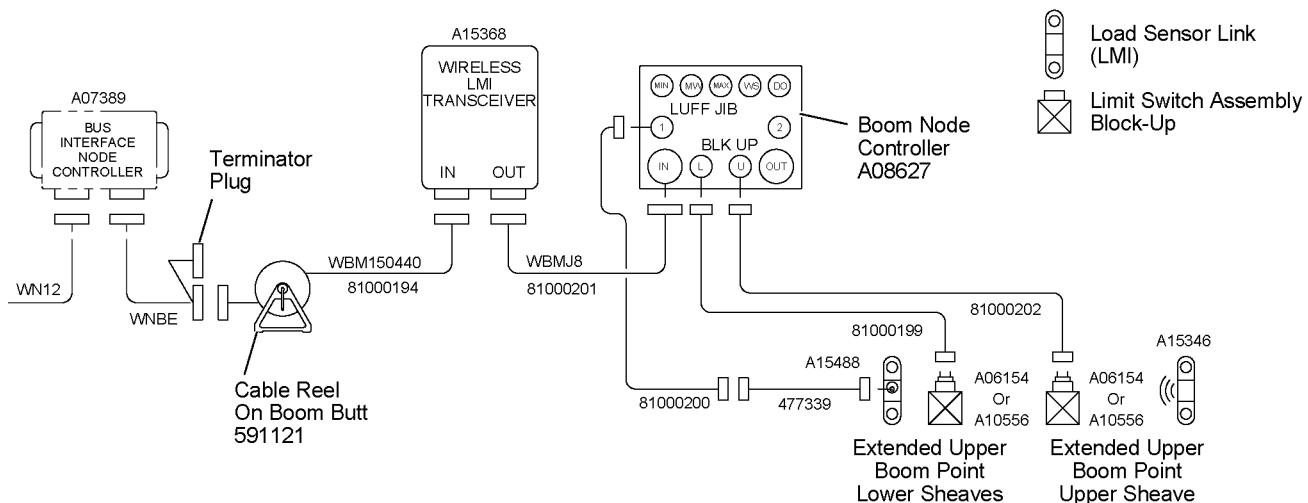
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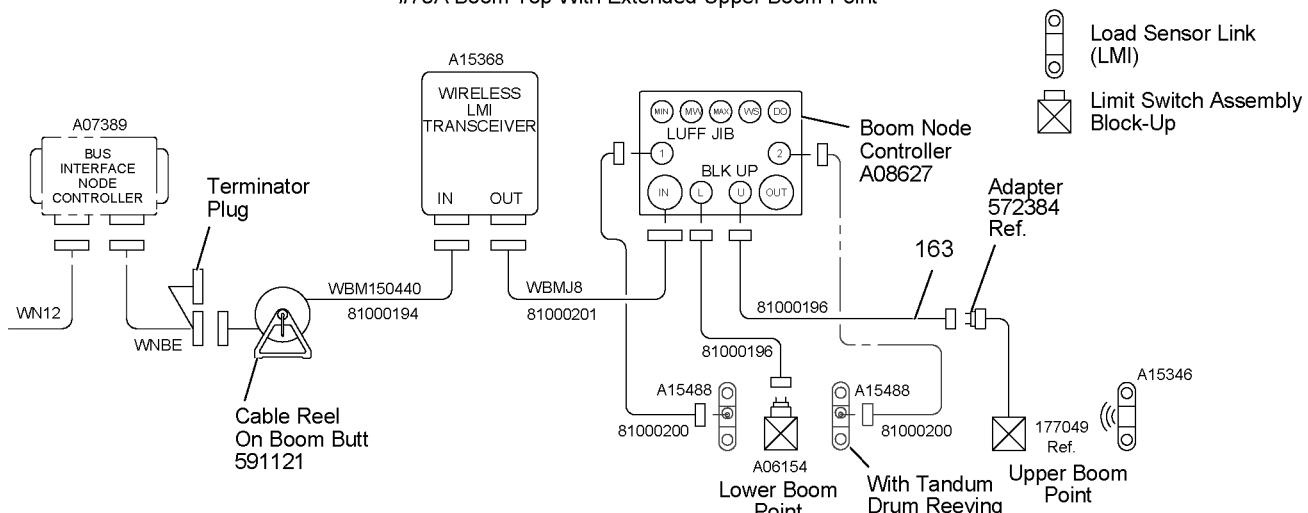
Wiring Interconnect Diagram

#55, #55A, Or #79A Boom Top With Upper Boom Point



Wiring Interconnect Diagram

#79A Boom Top With Extended Upper Boom Point

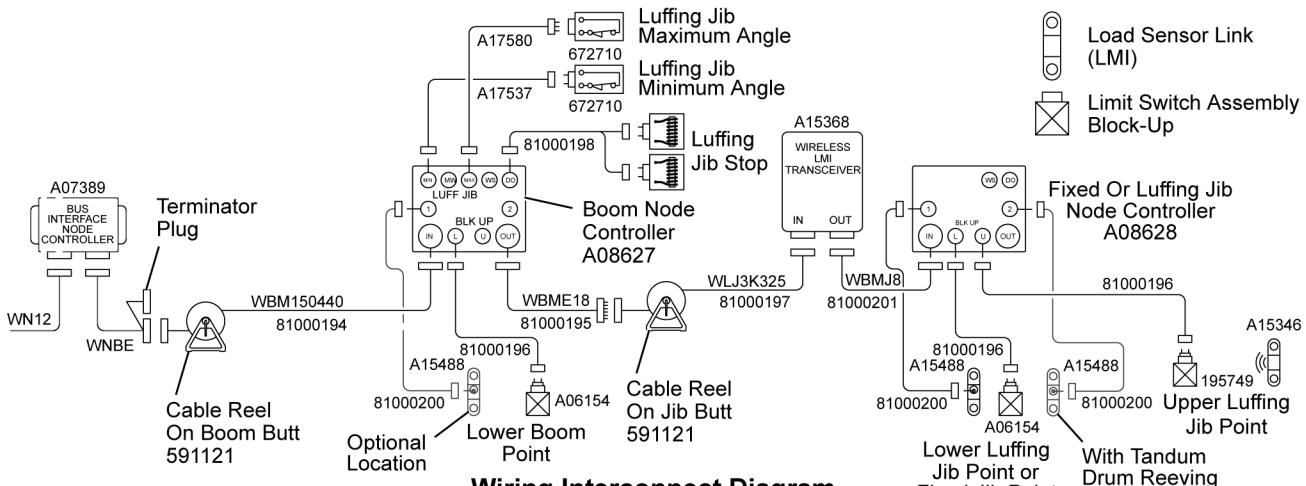


Wiring Interconnect Diagram

#55, #55A Or #79A Boom Top With Existing Upper Boom Point (170419 Ref.)
From 777, 888, M250. Or 2250.

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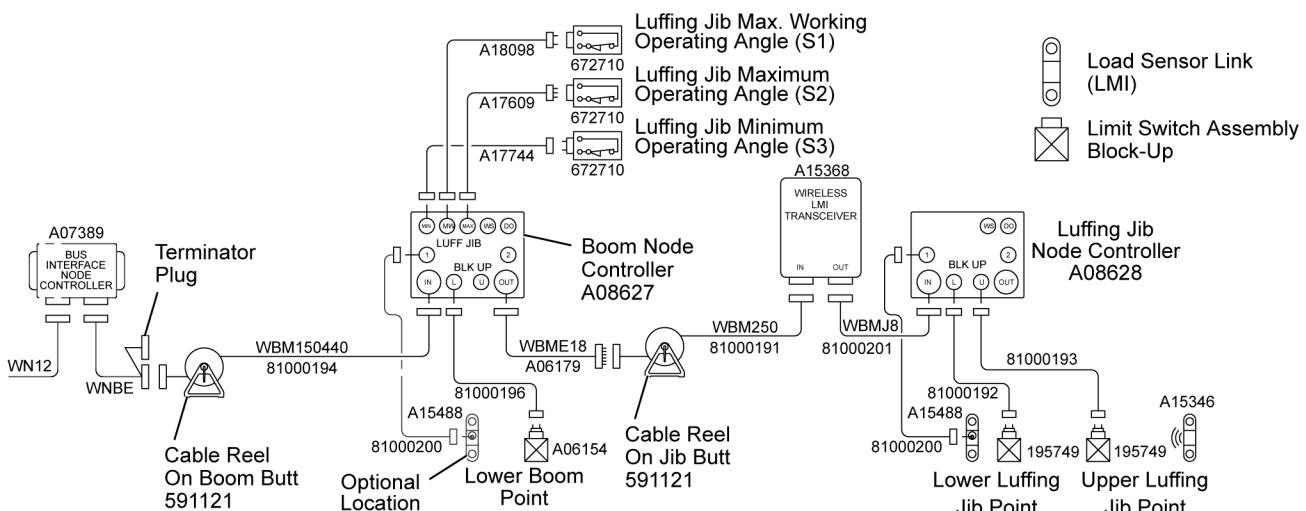
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Wiring Interconnect Diagram

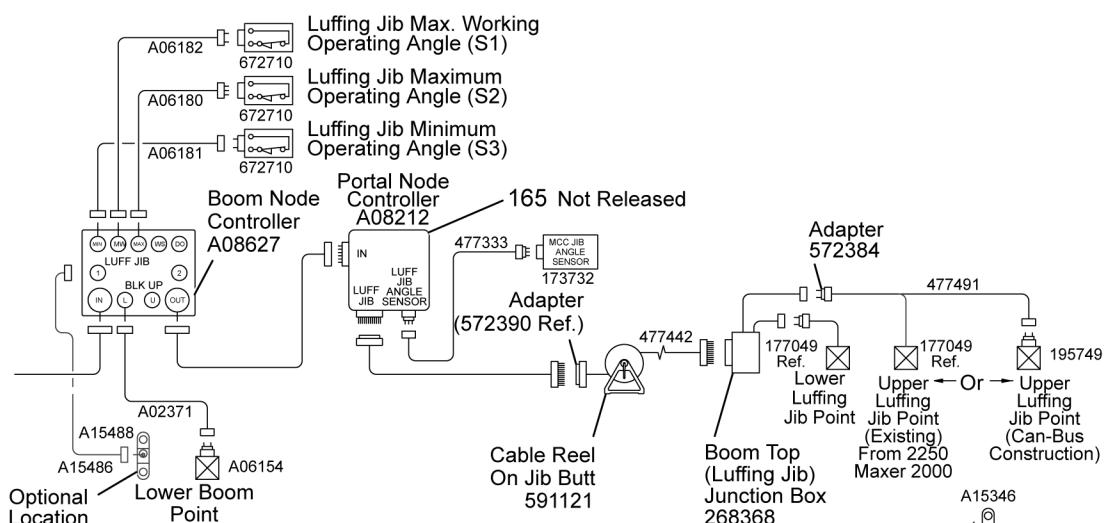
#55 Or #55A Boom Top With #79A Luffing Jib And Upper Luffing Jib Point

#55 Or #55A Boom Top With #79A Fixed Jib



Wiring Interconnect Diagram

#79A Boom Top With #44 Luffing Jib And Upper Luffing Jib Point

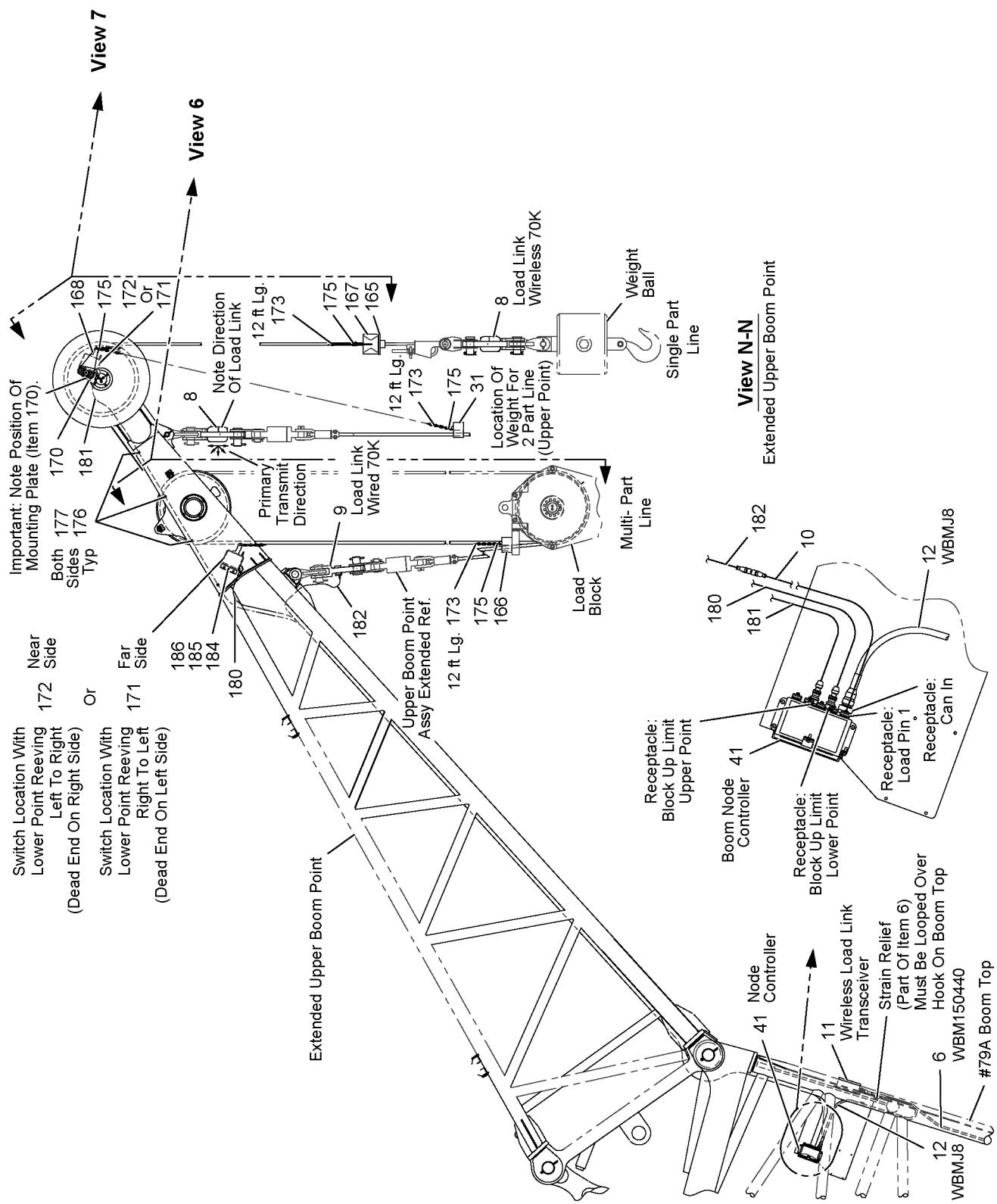


Wiring Interconnect Diagram

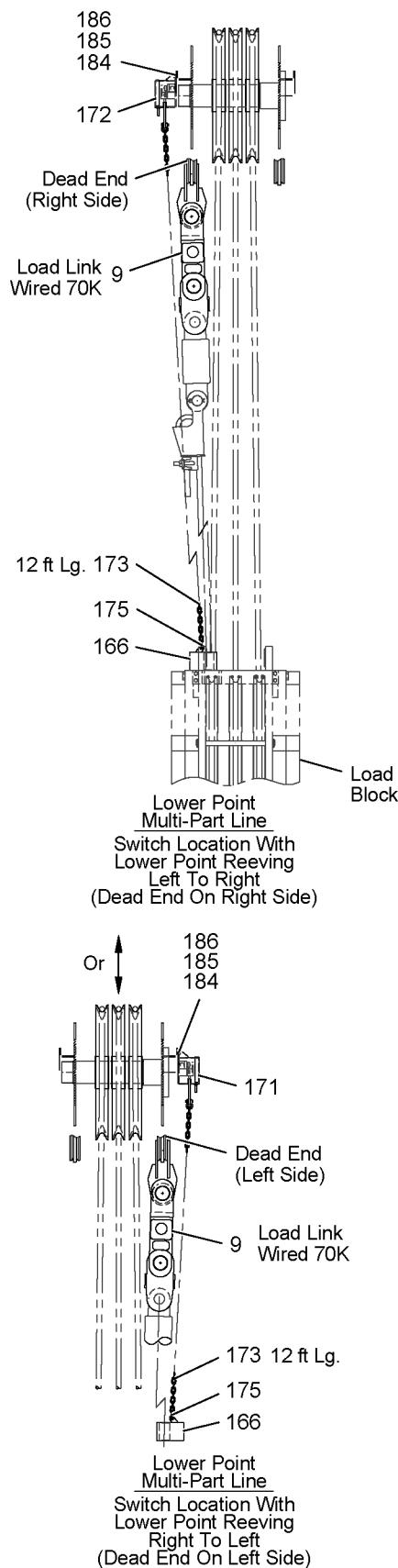
#79A Boom Top With 2250 (Existing Field) #44 Luffing Jib And Upper Luffing Jib Point

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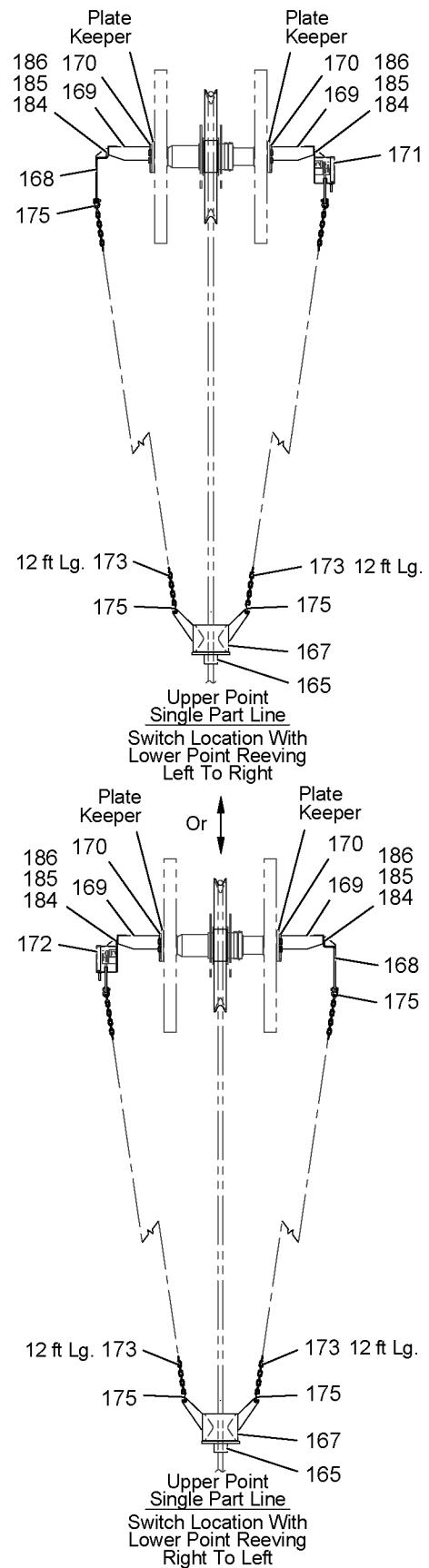
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View 6



View 7

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MODEL	18000		
CONTROL WIRING Boom & Limits			
ITEM	Part #	QTY.	DESCRIPTION OF PART
1	546054	4	NUT, Hex (3/8 -16UNC-2B)
2	591121	1	REEL, Cable
3	612456	4	SCREW, Hex Cap (3/8 -16UNC-2A x 1-1/4" long)
4	667042	36	STRAP, Stay (8" max dia) (see Note 6)
5	710304	4	WASHER, Lock (3/8")
6	81000194	1	CABLE, Electric Boom PWR/COMM WBM 150440
8	A15346	1	LINK, Load Cell 70K Wireless (2.4 GHz) (see Note 10)
9	A15488	1	LINK, Load Cell 70K Wired (see Note 10)
10	A15486	1	CABLE, Electric Load Link (20' long)
11	A15368	1	TRANSCEIVER (2.4 GHz, 125K baud) (see Note 11)
12	81000201	1	CABLE, Electric Boom Jumper WBMJ8 (see Note 11)
14	546052	4	NUT, Hex (1/4 -20UNC)
15	612363	4	SCREW, Hex Cap (1/4 -20UNC x 2" long)
16	710708	4	WASHER, Lock (1/4", int. shakeproof)
ADD FOR #55 OR #55A BOOM TOP			
18	624633	1	SHACKLE, Anchor (5/16", round pin)
19	667007	6	STRAP, Stay (see Note 7)
20	669280	6	STUD, Wire Tie (see Note 7)
21	A18332	8	WASHER, Lock External Countersink (1/4") (see Note 9)
23	A08627	1	CONTROLLER, Boom Node
24	81000196	1	CABLE, Electric Block-Up Limit
25	142403	1	WEIGHT
26	A06154	1	SWITCH ASSEMBLY
27	334101	1	CHAIN, Straight Link (12' long)
28	A18331	4	NUT, KEPS (M-1.0 zinc)
29	7126151256	4	SCREW, Hex Serrated Flange (M6 x 25)
ADD FOR #79A BOOM TOP			
31	142403	1	WEIGHT
32	A06154	1	SWITCH ASSEMBLY
33	334101	1	CHAIN, Straight Link (12' long)
34	A18331	4	NUT, KEPS (M-1.0 zinc)
35	7126151256	4	SCREW, Hex Serrated Flange (M6 x 25)
36	624633	1	SHACKLE, Anchor (5/16", round pin)
37	667007	6	STRAP, Stay (see Note 7)
38	669280	6	STUD, Wire Tie (see Note 7)
39	A18332	8	WASHER, Lock External Countersink (1/4") (see Note 9)
41	A08627	1	CONTROLLER, Boom Node
42	81000196	1	CABLE, Electric Block-Up Limit
ADD FOR SINGLE HOIST DRUM REEVING - LOWER POINT WITH 10 OR LESS PARTS OF LINE (#55, #55A, OR #79A BOOM/JIB TOPS)			
44	144853	1	PIN
45	A15357	1	BRACKET, Block Up Limit
ADD FOR UPPER BOOM POINT OR UPPER JIB POINT (REF. 170419) (NEW CONSTRUCTION)			
47	93657	1	BLOCK, Lift (single part line)
48	142403	1	WEIGHT (multi part line)

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MODEL	18000		
CONTROL WIRING Boom & Limits			
ITEM	Part #	QTY.	DESCRIPTION OF PART
49	162273	1	WEIGHT
50	168091	1	LUG
51	170120	2	BRACKET
52	195749	1	SWITCH ASSEMBLY
55	334101	2	CHAIN, Straight Link (9' long)
57	546054	11	NUT, Hex (3/8 -16UNC)
58	612456	11	SCREW, Hex Cap (3/8 -16UNC-2A x 1-1/4" long)
59	624633	3	SHACKLE, Anchor
60	667007	3	STRAP, Stay (see Note 7)
61	669280	3	STUD, Wire Tie (see Note 7)
62	710304	11	WASHER, Lock (3/8")
63	81000196	1	CABLE, Electric Block-Up Limit
ADD FOR #79A UPPER LUFTING JIB POINT OR UPPER BOOM POINT - #55, #55A, OR #79A (REF. A08516)			
65	93657	1	BLOCK, Lift (single part line)
66	142403	1	WEIGHT (multi part line)
67	162273	1	WEIGHT
68	168091	1	LUG
69	A04984	2	BRACKET
71	195749	1	SWITCH ASSEMBLY
73	334101	2	CHAIN, Straight Link (9' long)
75	546054	11	NUT, Hex (3/8 -16UNC)
76	612456	11	SCREW, Hex Cap (3/8 -16UNC-2A x 1-1/4" long)
77	624633	3	SHACKLE, Anchor
78	667007	3	STRAP, Stay (see Note 7)
79	669280	3	STUD, Wire Tie (see Note 7)
80	710304	11	WASHER, Lock (3/8")
81	81000196	1	CABLE, Electric Block-Up Limit
ADD FOR #79A LUFTING JIB OR #79A FIXED JIB			
84	142403	1	WEIGHT
85	A06154	1	SWITCH ASSEMBLY
88	334101	1	CHAIN, Straight Link (12' long)
90	A18331	4	NUT, KEPS (M-1.0 zinc)
91	546054	4	NUT, Hex (3/8 -16UNC-2B)
92	591121	1	REEL, Cable
94	7126151256	4	SCREW, Hex Serrated Flange (M6 x 25)
95	612456	4	SCREW, Hex Cap (3/8 -16UNC-2A x 1-1/4" long)
96	624633	1	SHACKLE, Anchor (5/16", round pin)
97	667007	3	STRAP, Stay (see Note 7)
98	667042	12	STRAP, Stay (see Note 6)
99	669280	3	STUD, Wire Tie (see Note 7)
100	A18332	8	WASHER, Lock External Countersink (1/4") (see Note 9)
101	710304	4	WASHER, Lock (3/8")
103	A07759	1	CABLE, Electric Luffing Jib WLJ3K325
104	A08628	1	CONTROLLER, Boom/Luffing Jib Node
105	A07068	1	CABLE, Electric Block-Up Limit
106	A06179	1	CABLE, Electric Boom Extension WBNE18

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MODEL 18000			
CONTROL WIRING Boom & Limits			
ITEM	Part #	QTY.	DESCRIPTION OF PART
ADD FOR #44 LUFFING JIB (NEW CONSTRUCTION)			
112	142403	1	WEIGHT
113	195749	1	SWITCH ASSEMBLY
116	334101	1	CHAIN, Straight Link (9' long)
118	A18331	4	NUT, KEPS (M-1.0 zinc)
119	546054	4	NUT, Hex (3/8 -16UNC-2B)
120	591121	1	REEL, Cable
122	7126151256	4	SCREW, Hex Serrated Flange (M6 x 25)
123	612456	4	SCREW, Hex Cap (3/8 -16UNC-2A x 1-1/4" long)
124	624633	1	SHACKLE, Anchor (5/16", round pin)
126	667042	12	STRAP, Stay (see Note 6)
128	A18332	8	WASHER, Lock External Countersink (1/4") (see Note 9)
129	710304	4	WASHER, Lock (3/8")
131	81000191	1	CABLE, Electric Boom PWR/COMM WBM250
132	A08628	1	CONTROLLER, Boom/Luffing Jib Node
133	81000192	1	CABLE, Electric Block-Up Limit (6' long)
134	81000195	1	CABLE, Electric Boom Extension PWR/COMM WBNE18
135	A06191	1	JIB STOP ASSEMBLY, Automatic #44 Luffing Jib
ADD FOR #44 UPPER LUFFING JIB POINT (REF. 174211) (NEW CONSTRUCTION)			
138	93657	1	BLOCK, Lift (single part line)
139	142403	1	WEIGHT (multi part line)
140	162273	1	WEIGHT
141	168091	1	LUG
142	170120	2	BRACKET
143	174713	2	PLATE, Mounting
144	195749	1	SWITCH ASSEMBLY
146	334101	2	CHAIN, Straight Link (9' long)
148	546054	6	NUT, Hex (3/8 -16UNC)
149	612456	6	SCREW, Hex Cap (3/8 -16UNC-2A x 1-1/4" long)
150	624633	3	SHACKLE, Anchor
151	667007	3	STRAP, Stay (see Note 7)
152	669280	3	STUD, Wire Tie (see Note 7)
153	710304	14	WASHER, Lock (3/8")
154	81000193	1	CABLE, Electric Block-Up Limit (15' long)
155	710304	6	SCREW, Cap (3/8"-16 UNC-2A x 7/8" Long)
ADD FOR #79A LUFFING JIB			
157	A15542	1	JIB STOP ASSEMBLY, Automatic #79A Luffing Jib
158	81000198	1	CABLE, Electric Luffing Jib Stop
ADD FOR UPPER BOOM POINT (170419 REF.) (EXISTING FIELD - 555, 777, 888, 999, M250, 2250)			
163	81000196	1	CABLE, Electric Block-Up Limit
ADD FOR EXTENDED UPPER BOOM POINT			
165	93657	1	BLOCK, Lift (single part line)
166	142403	1	WEIGHT (multi part line)
167	162273	1	WEIGHT

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ASSEMBLY A05580	REVISION I
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MODEL	18000		
CONTROL WIRING Boom & Limits			
ITEM	Part #	QTY.	DESCRIPTION OF PART
168	168091	1	LUG
169	170120	2	BRACKET
170	174713	2	PLATE, Mounting
171	A06154	1	SWITCH ASSEMBLY
172	A10556	1	SWITCH ASSEMBLY
173	334101	3	CHAIN, Straight Link (12' long)
175	624633	4	SHACKLE, Anchor
176	667007	8	STRAP, Stay (see Note 7)
177	669280	8	STUD, Wire Tie (see Note 7)
178	667042	8	STRAP, Stay
180	81000199	1	CABLE, Electric Block-Up Limit (36' long)
181	81000202	1	CABLE, Electric Block-Up Limit (46' long)
182	477339	1	CABLE, Harness Extension Micro-Change (19.7' long)
184	546054	12	NUT, Hex (3/8 -16UNC-2B)
185	612456	12	SCREW, Hex Cap (3/8 -16UNC-2A x 1-1/4" long)
186	710304	12	WASHER, Lock (3/8")
ADD FOR 55, 55A, OR 79A LOWER BOOM POINT OR LOWER JIB POINT WITH TANDUM (2 DRUM) REEVING			
189	A15488	1	LINK, Load Cell 70k Wired
190	81000200	1	CABLE, Electric (load link - 20')
			<p>Note 1: Block-up limit control is intended as a protective device. It is not to be used as a hoist distance control for specific job applications.</p> <p>Note 2: Periodic checks should be made to insure that block-up limit control is functioning properly.</p> <p>Note 3: CAUTION: Block-up limit control system may not function at machines maximum single line speed - carefully check each machine for maximum safe line speed.</p> <p>Note 4: For blocks without actuator brackets see modification dwg 184433 customer furnished.</p> <p>Note 5: When a locking swivel is placed in the wire rope dead end, allow extra length in chain equal to length of the locking swivel added.</p> <p>Note 6: Attach cable to boom or jib by using straps at approximately 10 ft intervals.</p> <p>Note 7: Attach cable to boom top or jib top between junction box and switch by using weld studs at approximately 1 to 2 ft intervals.</p> <p>Note 8: For Receptacles Equipped With Shorting Plugs: Shorting plugs must be plugged in whenever receptacle is not being used.</p> <p>Note 9: Electrical enclosures are to be mounted as shown in view G-G, View H-H, View K-K and view L-L. Torque the KEPS nuts tight to establish less than .01 ohms between frame and enclosure receptacle shells. All enclosure mounting bolts must be electrically common to one another (less than .01 ohms).</p>

ASSEMBLY A05580	REVISION I
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PLEASE GIVE MACHINE SERIAL NUMBER WITH ORDER

MODEL 18000			
CONTROL WIRING Boom & Limits			
ITEM	Part #	QTY.	DESCRIPTION OF PART
			<p>Note 10: The basic bill of material contains one wired load link (item 9) and one wireless load link (item 8). The wired load link (item 9) is typically used on the lower point (even multi-parts of line) and the wireless load link (item 8) is typically used on the upper point (single or two part line).</p> <p>One additional wired load link (1 item 189) is required and used on the lower boom point or lower jib point for tandem drum operation.</p> <p>Note 11: Transceiver (item 11) and cable WBMJ8 (item 12) are mounted on the jib top for luffing jib or fixed jib applications.</p>

PLEASE GIVE MACHINE SERIAL NUMBER WITH ORDER

ASSEMBLY A05580	REVISION I
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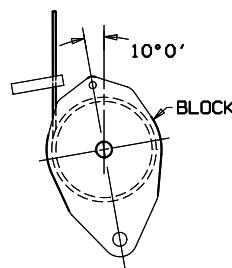
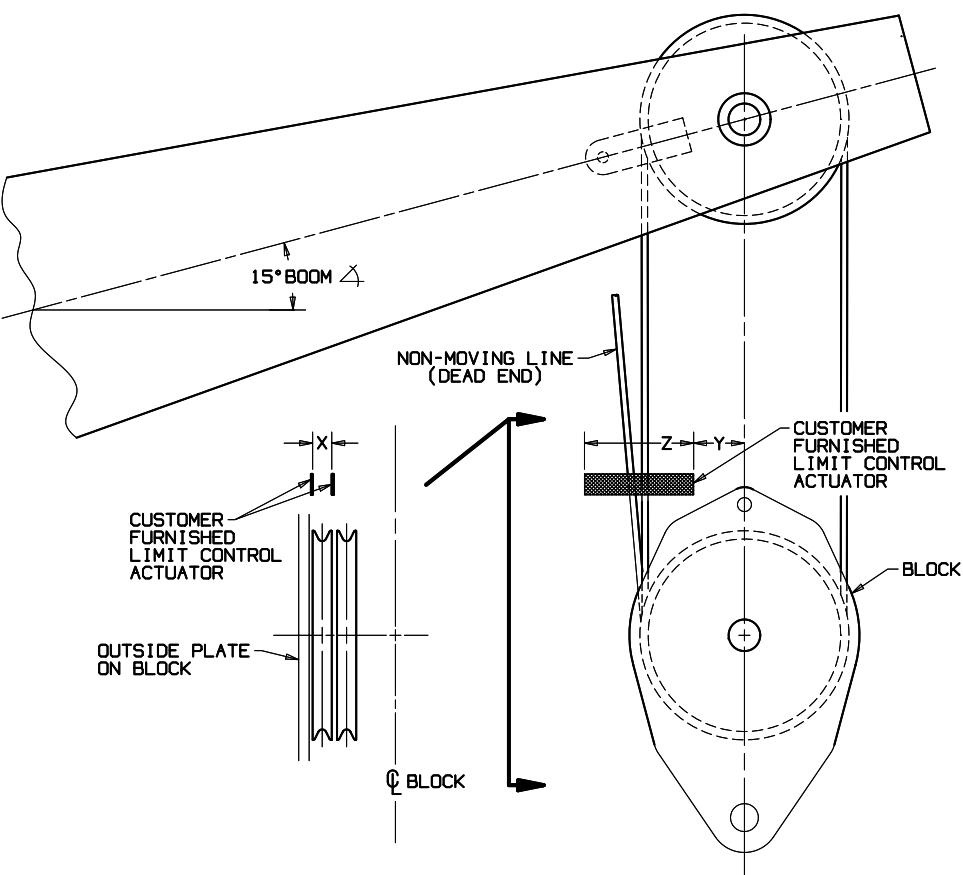
MODEL	18000		
CONTROL WIRING Boom & Limits			
ITEM	Part #	QTY.	DESCRIPTION OF PART

ASSEMBLY A05580	REVISION I
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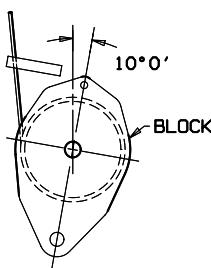
PLEASE GIVE MACHINE SERIAL NUMBER WITH ORDER

C

C



VIEW A



VIEW B

BILL OF MATERIAL				ASSEMBLIES USED ON	
ITEM NO. NO. REQ'D.	SECTION	DESCRIPTION	LENGTH IN.	MATERIAL	CODE NO. OR DWG. NO.

NOTE:

1. LIMIT CONTROL ACTUATOR MUST ENCLOSE THE LINE TO EITHER THE DEAD END OR UNIVERSAL WIRE ROPE ANCHOR JOINT. THE LOCATION OF THIS LINE DEPENDS ON THE PARTS OF LINE REQUIRED AND THE TYPE OF REEVING.
- 2: THE "X" DISTANCE MUST BE SUFFICIENT TO PROVIDE ADEQUATE CLEARANCE WITH ADJACENT PARTS OF LINE, AND ALSO PROVIDE A BASE FOR WEIGHT TO SET ON.
- 3: THE "Y" DISTANCE MUST BE SUFFICIENT FOR ACTUATOR TO SUPPORT THE WEIGHT WHEN THE ACTUATOR IS ATTACHED TO A BLOCK ROTATED 10°. (SEE VIEW "A")
- 4: LIMIT CONTROL ACTUATOR LENGTH "Z" MUST SUPPORT THE WEIGHT WHEN THE ACTUATOR IS ATTACHED TO A BLOCK ROTATED 10°. (SEE VIEW "B")
5. LIMIT CONTROL ACTUATOR MUST BE STRUCTURALLY STRONG ENOUGH TO WITHSTAND THE IMPACT OF HITTING THE WEIGHT WHILE HOISTING THE BLOCK.
6. IT IS THE CUSTOMERS OBLIGATION TO ADEQUATELY ATTACH THE ACTUATOR TO HIS BLOCK.

REVISIONS
01-31-97 NVS
AI REDRAWN ON
CADRA

DWG. NO.
184433

DATE
12-11-80
PATTERN NO.

SCALE 1:1	Manitowoc Cranes, Inc. Manitowoc, Wisconsin	LOAD BLOCK
DR. DWD		CONVERSION FOR
EX. WM	MODEL ALL	LIMIT CONTROL ASSEMBLY
APP MR		

DWG. NO.
184433

TECHNICAL BULLETIN

BRIDON AMERICAN

280 New Commerce Boulevard Wilkes-Barre, PA 18706

Telephone: (570) 822-3349 1-800-521-5555

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Form No. TBRR-192

Rotation Resistant Ropes

Rotation Resistant Ropes are defined as stranded ropes designed to generate reduced levels of torque and rotation when loaded, and are comprised of an assembly of two or more layers of strands laid helically around a center. The direction of lay of the outer strands being opposite to that of the underlying layer.

Rotation Resistant Ropes are grouped into the following categories based on construction:

Rotation Resistant Rope — category 1: Stranded rope constructed in such a manner that it displays little or no tendency to rotate, or, if guided, transmits little or no torque, has at least fifteen outer strands and comprising an assembly of at least three layers of strands laid helically over a center in two operations, the direction of lay of the outer strands being opposite to that of the underlying layer (i.e. Endurance Dyform 34LR, Endurance 35LS).

Rotation Resistant Rope — category 2: Stranded rope constructed in such a manner that it has significant resistance to rotation, has at least ten outer strands and comprising an assembly of two or more layers of strands laid helically over a center in two or three operations, the direction of lay of the outer strands being opposite that of the underlying layer (i.e. Endurance Dyform 18, Endurance 19).

Rotation Resistant Rope — category 3: Stranded rope constructed in such a manner that it has limited resistance to rotation, has no more than nine outer strands and comprising an assembly of two layers of strands laid helically over a center in two operations, the direction of lay of the outer strands being opposite to that of the underlying layer (i.e. Endurance 8RR).

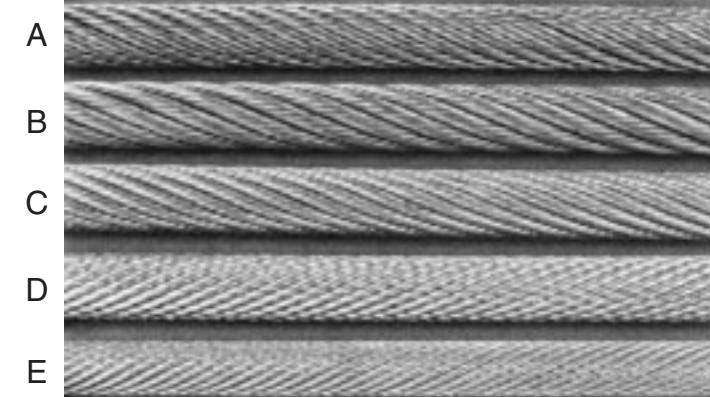
While this properly defines the ropes, it does not tell the complete story about a commonly misunderstood and often misused product.

All of these ropes have specific operating and performance characteristics and some have limitations. An overview of certain operating characteristics shows the following:

	Endurance 19	Endurance 8RR	Endurance Dyform-18	Endurance Dyform 34LR & 35LS
Multiple Part Reeling	No	Yes	Yes	Yes
Single Part Reeling	Yes*	Yes*	Yes*	Yes
Swivels	No	No	No	Yes
Strength	Low	Low	High	Highest
Preformed	Yes	Yes	Partially	No
Multiple Layer Winding	Yes	Yes	Yes	Yes
Prevention of Block Spinning	N/A	Good	Much Better	Best

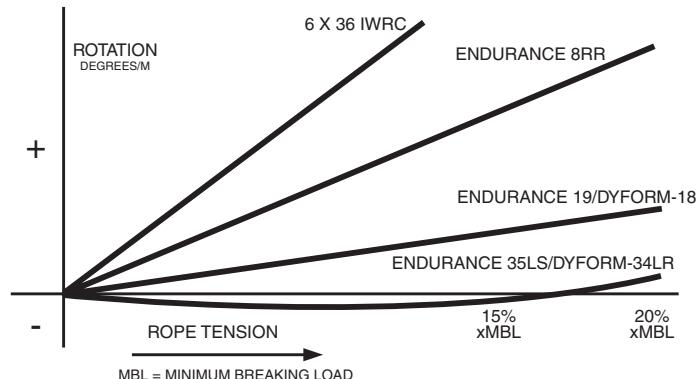
More detail and further explanation of these characteristics and limitations will be covered in the following discussions.

*These ropes should be limited to a maximum fall of 150 times the rope diameter (i.e. 1/2" rope x 150 = 75') when used single part, or rope distortion and damage may occur.



A. Endurance 19; B. Endurance 8RR; C. Dyform-18;
D. Dyform-34LR; E. Endurance 35LS

DIAGRAMATIC ILLUSTRATION OF ROTATION VARIOUS ROPE CONSTRUCTIONS



STANDARD APPLICATIONS

- Mobile Cranes and Overhead Hoists: Endurance 19 and Endurance 8RR
- Mobile Cranes and Overhead Hoists: Endurance Dyform-18
- Tower Cranes and Various Hoisting Applications: Endurance Dyform 34LR and Endurance 35LS

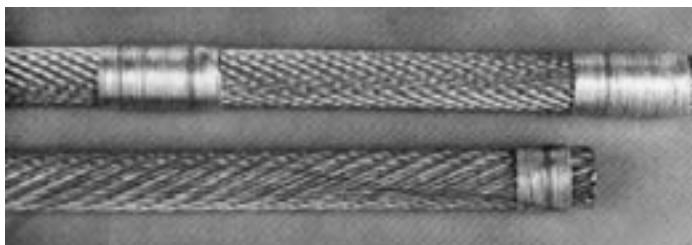
All Rotation Resistant Ropes can be used in a variety of other applications, but the specific application and the operating requirements should be carefully reviewed by BAC Technical Services or a qualified person before a recommendation can be made.

SEIZING AND CUTTING

Because Rotation Resistant Ropes can be difficult to properly identify by sight, it is recommended that all Rotation Resistant Ropes be tightly seized with wire, strand or tape; or welded before cutting. It is important that all Rotation Resistant Ropes be prevented from unloring when cut regardless of construction. General guidelines for seizing and welding are shown in detail below. Endurance 35LS and Endurance Dyform 34LR should have welded ends and not seized ends.

PREFORMED/NON-PREFORMED

Rotation Resistant Ropes are special ropes and are produced with special manufacturing techniques to meet all of the required operating parameters of the ropes. To prevent confusion as to which are preformed, partially preformed and non-preformed, Bridon American attaches a warning tag on Rotation Resistant Ropes to indicate that they should always be properly seized when cut.

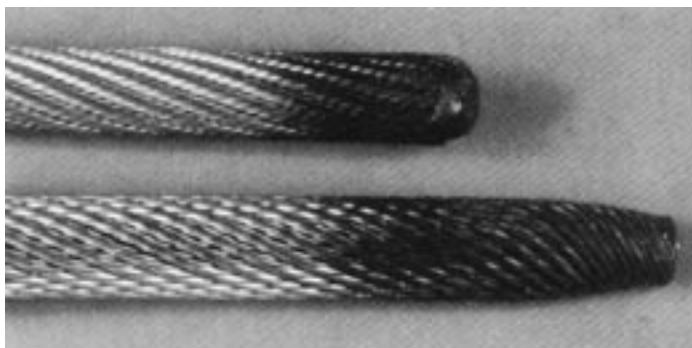


NOTE: Two seizures are recommended for non-preformed rope (two rope diameters in length), and one seizing for preformed rope (one rope diameter in length).

WELDED ENDS

A welded rope end can facilitate the installation of a Rotation Resistant Rope in a wedge socket. A welded rope end combined with a tail of less than 20 rope diameters can cause rope distortion. If the proper tail length is used, a welded end is acceptable.

Capped welded end.



Tapered and welded end.

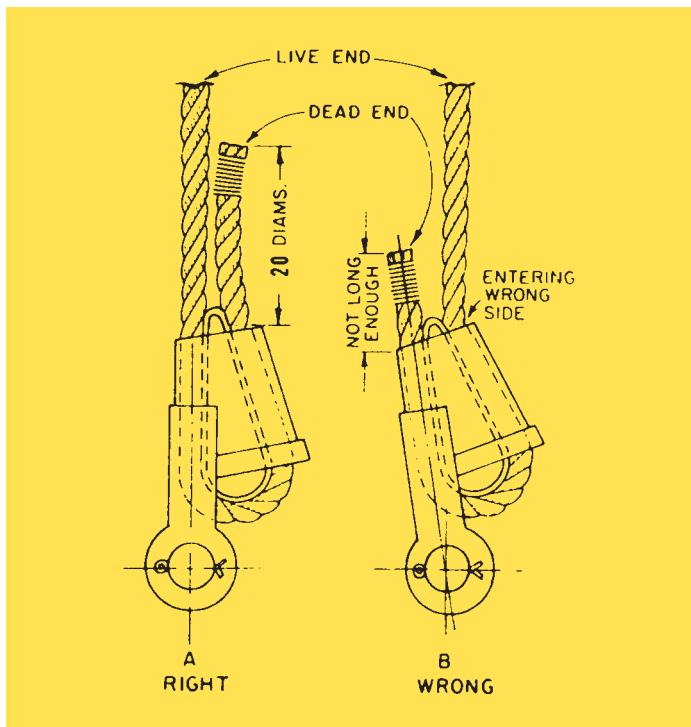
HANDLING/INSTALLATION

Rotation Resistant Ropes must have properly seized, or welded ends. They must be installed without inducing twist or turn. They must not be kinked, and they must have the proper tail length at the wedge socket.

WEDGE SOCKETS

All Rotation Resistant Ropes can be used with standard wedge sockets. Certain precautions must be taken. All Rotation Resistant Ropes should be tightly seized with wire, strand or tape; or welded to prevent loss of rope lay at the dead end. Loss of rope lay will change the operating characteristics of the ropes and can cause high strands and rope distortion.

The dead end should be a minimum length of 20 rope diameters for all Rotation Resistant Ropes with either welded or seized ends. A wire rope clip may be attached to the dead end.



SWIVELS

BAC recommends that Endurance 19, Endurance 8RR, and Endurance Dyform-18 not be dead ended into a swivel, unless used under specific conditions and with specific limitations. Endurance Dyform 34LR and Endurance 35LS may be used with a swivel in any application, but when used in multiple part reeving a swivel is not necessary, therefore not recommended. All Rotation Resistant Ropes will rotate to some extent under load. Excessive rotation will cause imbalance and reduction in strength. Under a shock load or overload condition, the strength of these ropes can be reduced as much as 50%.

BAC does recognize that there are certain applications where safety or operating requirements demand the use of a swivel with Rotation Resistant Ropes. In these cases, it is mandatory that the design factor be strictly followed, the ropes are not shock loaded,

and the ropes are frequently inspected by a qualified person. BAC recommends that each application requiring the use of a swivel with Rotation Resistant Ropes be reviewed and approved by a qualified person.

There has been some confusion about swivels attached between the rope and the dead end attachment point and swivels below the traveling block (between the block and the load). For the purpose of the previous discussion, we are referring to the swivel attachment between the rope and the dead end attachment point. Most swivels below the traveling block are not anti-friction ball bearing swivels.

MULTIPLE PART REEVING

Endurance 19 ropes are not recommended for multiple part reeving. These ropes do not perform well and tend to become imbalanced when used in this manner. Endurance 8RR, Endurance Dyform-18, Endurance Dyform 34LR, and Endurance 35LS are more stable constructions and can be used in multiple part reeving.

SINGLE PART HOISTING

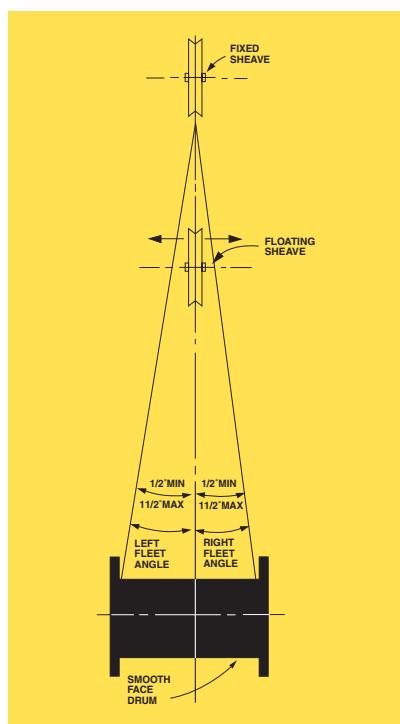
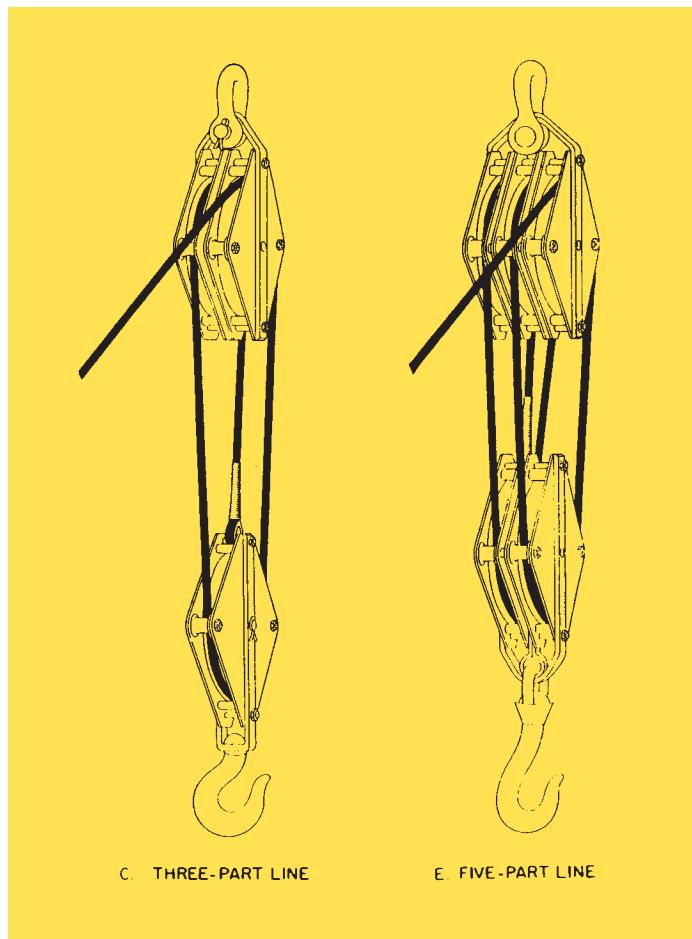
All Rotation Resistant Ropes can be used in single part hoisting. However, the limitations of single part hoisting must be understood. Rotation Resistant Ropes will develop torque when a load is applied and rotation of the load can occur. The amount of rotation depends on many factors.

Endurance 8RR, Endurance 19, and Endurance Dyform-18 when used single part should be limited to a maximum fall of $150 \times \text{rope diameter}$ (i.e. $1/2" \times 150 = 75'$) or distortion and damage may occur.

If the loads being handled under all operating conditions are within the recommended design factors, the amount of rotation should not cause problems. If the rope is shock loaded or loaded beyond the recommended design factor, rotation of the rope will be a problem. As stated previously, when Rotation Resistant Ropes rotate, the strength of the rope is reduced. If the rotation is severe enough, the rope can fail or rapidly develop broken wires and wear in the inner rope where it can be difficult to detect.

ODD PART REEVING

Odd part reeving such as 3, 5 or 7 part can cause problems if the traveling block is not properly aligned. While a greater number of parts, reeved in an even number will require slower hoisting speeds, it can prevent problems. If odd part reeving is necessary, the dead end at the traveling block should be attached to the center of the block rather than at the side of the block (see opposite, top). An odd part reeving system can cause the traveling block to be suspended and hang at an angle. This misalignment will induce twist into the rope during operation by the rope climbing the flange or rolling into the sheaves of the traveling block during hoisting.



FLEET ANGLES

Because Rotation Resistant Ropes develop less torque under load than a standard 6 strand rope, there can be a problem with rope pileup and poor spooling unless a proper fleet angle is maintained. The fleet angle becomes even more important with the Rotation Resistant ropes such as Endurance Dyform 34LR and Endurance 35LS. A fleet angle of $1/2^\circ$ to $1-1/2^\circ$ is recommended for all Rotation Resistant Ropes.

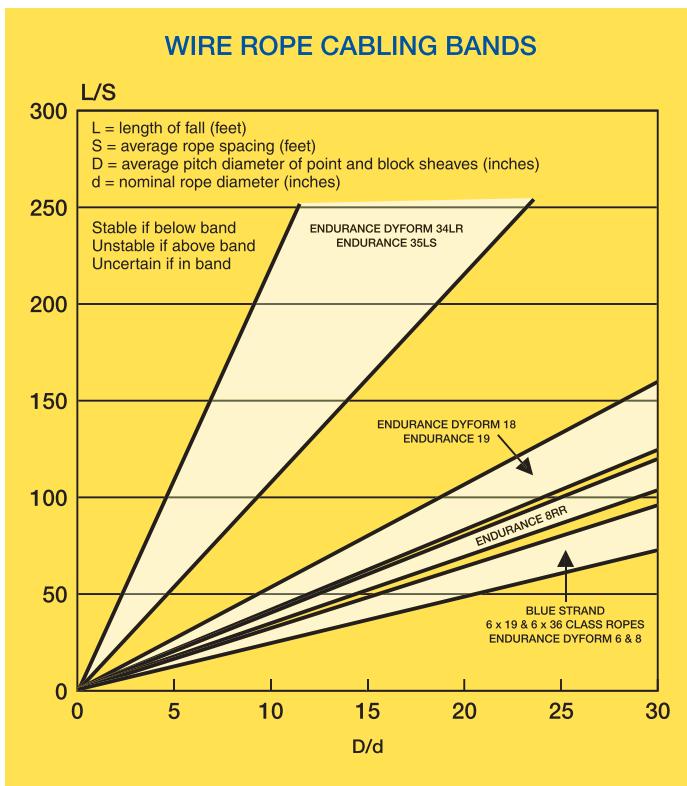
CABLING GRAPH

Field research jointly conducted by the Wire Rope Technical Board and the Power Crane and Shovel Association has shown that cabling of the rope parts in a multiple part reeved hoisting arrangement is controlled by several factors. The following calculations and graphs can be used to determine when and if cabling will occur on multiple part reeved hoisting arrangements.

The graph illustrates two dimensional ratios. They are:

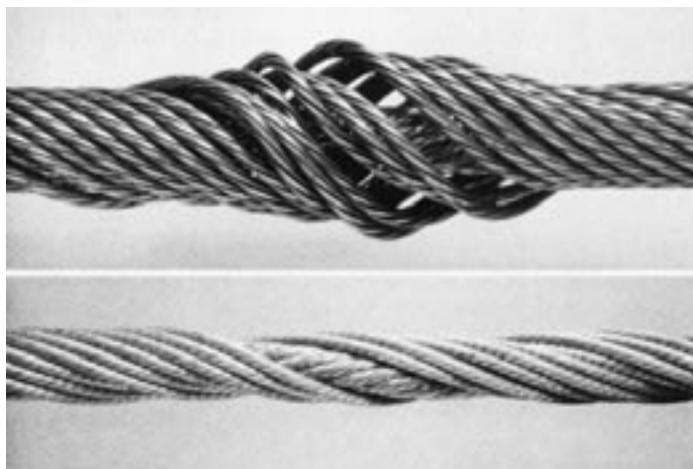
1. L/S = Length of fall per unit rope spacing.
2. D/d = Average pitch diameter of traveling and crown block sheave per unit rope diameter.

Various constructions of rope shown on the graph indicate the limited conditions for torsional stability with the angular displacement of the hoist block to a maximum of 90 degrees. When the operating conditions for a particular installation give a resultant above the appropriate band, then cabling of the falls will most likely occur. If the operating conditions give a resultant below any particular band, the cabling of the falls will most likely not occur. If the operating conditions for any particular installation fall within the band, cabling is unpredictable.



RETIREMENT CRITERIA

Recommended retirement criteria for all Rotation Resistant Ropes are 2 broken wires in 6 rope diameters or 4 broken wires in 30 rope diameters (i.e. 6 rope diameters for a 1" diameter rope = 6").



Distortion of Rotation Resistant Ropes, as shown above, can be caused by shock load/sudden load release and/or induced torque and is the reason for immediate removal from service.

RECOMMENDED MINIMUM SHEAVE AND DRUM DIAMETERS

The minimum D/d ratio allowed by applicable codes and standards covering equipment where Rotation Resistant Ropes are typically used is 18:1.

RECOMMENDED MINIMUM DESIGN FACTOR

The minimum design factor allowed by applicable codes and standards covering equipment where Rotation Resistant Ropes are typically used is 5.

BRIDON AMERICAN

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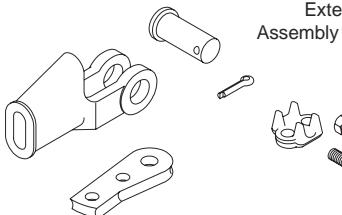


Dyform is a registered trademark of Bridon American Corporation.

WARNING: Any warranties, expressed or implied, concerning the use of this product apply only to the nominal strength of new, unused wire rope. All equipment using this product must be properly used and maintained. Wire rope must be properly stored, handled, used and maintained. Most importantly, wire rope must be regularly inspected during use. Damage, abuse or improper maintenance can cause rope failure. Consult the AISI Wire Rope Users Manual, ASME or ANSI Standards, or Bridon American Corporation before usage. Wire rope removal criteria are based on the use of steel sheaves. If synthetic sheaves are used, consult the sheave equipment manufacturer. **WARNING!**



WEDGE SOCKET WARNINGS AND APPLICATION INSTRUCTIONS



**S-421T / US-422T™
“TERMINATOR”**

NOTE: Existing Crosby S-421 Wedge Sockets can be retrofitted with the New Terminator Wedge. The only existing US-422 Wedge Sockets that can be retrofitted with terminator wedges are US4, US6 and US8.

See the Crosby Catalog for additional information.

New **QUIC-CHECK®** “Go” and “No-Go” features cast into wedge. The proper size wire rope is determined when the following criteria are met: 1. The wire rope shall pass thru the “Go” hole in the wedge. 2. The wire rope shall NOT pass thru the “No-Go” hole in the wedge.



Important Safety Information - Read and Follow

Inspection/Maintenance Safety

- Always inspect socket, wedge and pin before using.
- Do not use part showing cracks.
- Do not use modified or substitute parts.
- Repair minor nicks or gouges to socket or pin by lightly grinding until surfaces are smooth. Do not reduce original dimension more than 10%. Do not repair by welding.
- Inspect permanent assemblies annually, or more often in severe operating conditions.
- Do not mix and match wedges or pins between models or sizes.
- Always select the proper wedge and socket for the wire rope size.

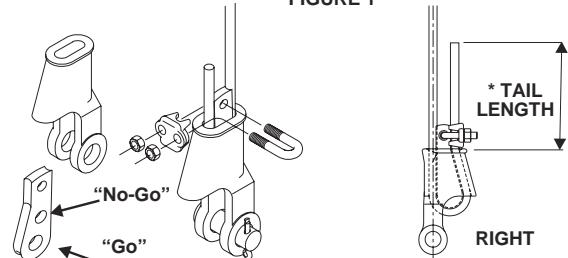
Assembly Safety

- Use only with standard 6 to 8 strand wire rope of designated size. For intermediate size rope, use next larger size socket. For example: When using 9/16" diameter wire rope use a 5/8" size Wedge Socket Assembly. Welding of the tail on standard wire rope is not recommended. The tail length of the dead end should be a minimum of 6 rope diameters but not less than 6" (See Figure 1).
- **To use with Rotation Resistant wire rope** (special wire rope constructions with 8 or more outer strands) ensure that the dead end is welded, brazed or seized before inserting the wire rope into the wedge socket to prevent core slippage or loss of rope lay. The tail length of the dead end should be a minimum of 20 rope diameters but not less than 6" (See Figure 1).
- Properly match socket, wedge and clip (See Table 1) to wire rope size.
- Align live end of rope, with center line of pin. (See Figure 1)
- Secure dead end section of rope. (See Figure 1)
- Tighten nuts on clip to recommended torque. (Table 1)
- Do not attach dead end to live end or install wedge backwards. (See Figure 2)
- **Use a hammer to seat Wedge and Rope as deep into socket as possible before applying first load.**

WARNING

- Loads may slip or fall if the Wedge Socket is not properly installed.
- A falling load can seriously injure or kill.
- Read and understand these instructions before installing the Wedge Socket.
- Do not side load the Wedge Socket.
- Apply first load to fully seat the Wedge and Wire Rope in the socket. This load should be of equal or greater weight than loads expected in use.
- Do not interchange wedges between S-421T and US422T or between sizes.

FIGURE 1



***Tail Length**

Standard 6 to 8 strand wire rope	Rotation Resistant Wire Rope
A minimum of 6 rope diameters, but not less than 6"	A minimum of 20 rope diameters, but not less than 6".

TABLE 1

Rope Size	3/8	1/2	5/8	3/4	7/8	1	1 1/8
Clip Size	3/8	1/2	5/8	3/4	7/8	1	1 1/8
*Torque Ft./lbs.	45	65	95	130	225	225	225

* The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.

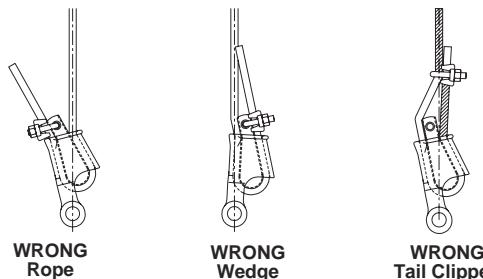


Figure 2

Operating Safety

- Apply first load to fully seat the Wedge and Wire Rope in the socket. This load should be of equal or greater weight than loads expected in use.
- Efficiency rating of the Wedge Socket termination is based upon the catalog breaking strength of Wire Rope. The efficiency of a properly assembled Wedge Socket is 80%.
- During use, do not strike the dead end section with any other elements of the rigging (Called two blocking).

SECTION 5

LUBRICATION

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SECTION 5

LUBRICATION

GENERAL LUBRICATION

Depending on the options the crane or attachment is equipped with, some lubrication points given in this section may not apply.

LUBRICATION INTERVALS

The intervals listed in this Lubrication Guide are for "average operating conditions" based on experience gained by testing lubricants at the factory and on recommendations given by the lubricant suppliers. Severe operating conditions (excessively dusty or corrosive atmosphere, unusually high or low outside temperature, extreme loadings, uncommonly frequent or long operating cycles) may require shortening the lubrication intervals. Follow the intervals given in this section until adequate experience is obtained to establish intervals which meet your operating conditions.

Bearings and bushings that are too warm, excessive play in moving parts, binding in moving parts, excessive or abnormal wear in gears and chains, and rust accumulation indicate a lack of lubrication. If these conditions are found during regular inspection, the lubrication interval for the faulty parts should be shortened.

CAUTION

Machinery Damage!

Before lengthening lubrication intervals, check that all parts are receiving an adequate supply of clean lubricant; otherwise, parts will be damaged from a lack of lubrication. Contact your Manitowoc Crane Care distributor for recommendations on lengthening lubrication intervals.

OVER-LUBRICATION

Over-lubrication is not only wasteful but also harmful:

- Oil or grease which drips onto walkways can cause personnel to slip and be hurt.
- An extra shot of grease, if too stiff or under too much pressure, can pop out a bearing seal.

LUBRICATION TIPS

- Keep oil and grease dispensers and containers tightly closed and stored in a dirt and moisture-free locations.
- Clean grease fittings before and after applying grease.
- Apply grease until the bushing or bearing is purged so dirt and water cannot enter. Wipe up excess grease.

OIL CAN POINTS

Oil all pins not equipped with grease fittings with engine oil every 40 hours of operation (even if the crane is not being operated).

WIRE ROPE LUBRICATION

New wire rope is lubricated during manufacturing, but this lubricant is only adequate for initial storage and the early stages of operation. To prevent the damaging effects of corrosion and to reduce wear, the wire rope must be lubricated at regular intervals.

Contact your wire rope manufacturer/dealer for lubrication recommendations. The lubrication interval and the type of lubricant used depends on the type of wire rope, the severity of duty, and the type of corrosive elements the wire ropes is subjected to.

The wire rope must be properly protected at all times. The lubricant must be fluid enough to fully penetrate the strands and rope core. Use one of the methods shown in Figure 5-1 to lubricate the wire rope. For maximum penetration, apply lubricant where the wire rope "opens up" as it travels around a sheave or winds onto a drum.

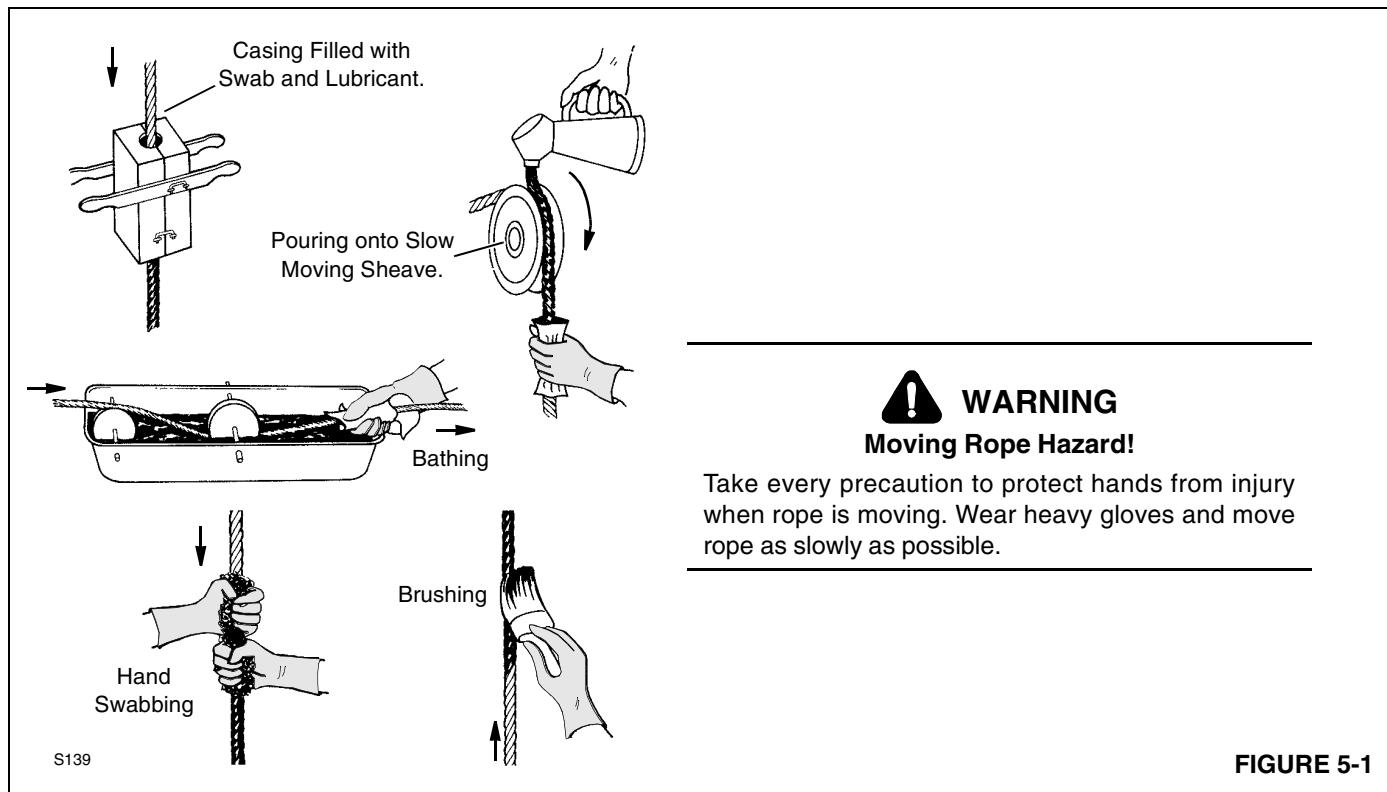
The wire rope must be clean and dry before applying lubricant; an air jet, or wire brush are some cleaning methods.

Do not use grease to lubricate wire rope. Grease will not penetrate rope properly and will buildup in valleys between wires and strands. This buildup will inhibit rope inspection and could trap moisture in rope's interior.

APPROVED GREASE

CraneLUBE E.P. #2 (MCC #471197) for all grease points.





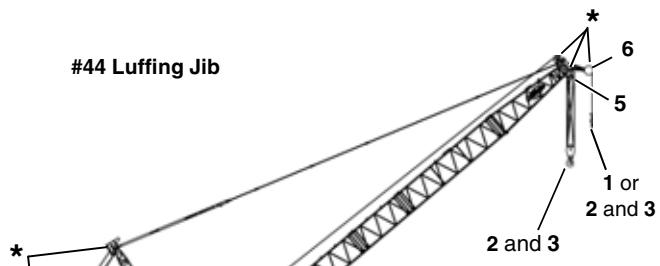
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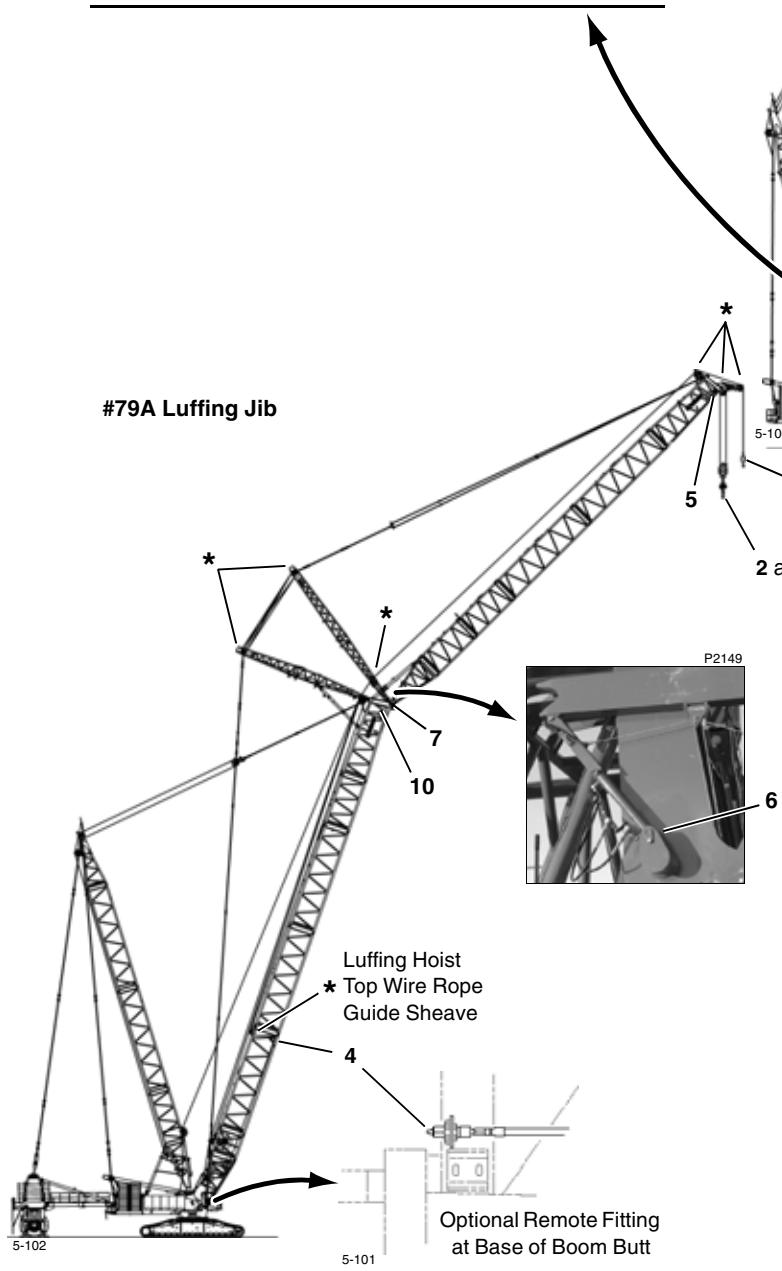
#44 Luffing Jib

**CAUTION
Parts Damage**

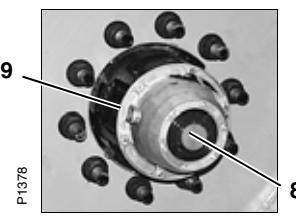
If luffing jib is to be operated when air temperature is below 32°F (0°C), drain and refill hydraulic systems (crane and boom) with Petro Canada Hydrex XV hydraulic oil. Be sure that jib strut cylinders and supply lines are completely drained before refilling.

For operation below 10°F (-12°C) use a thinner fluid such as Petro Canada Premium Arctic 15.

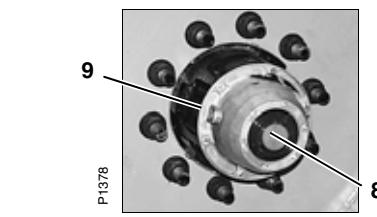
#79A Luffing Jib



Jib Point Dolly



9
8
4 Places



9
8
4 Places

#44 LUFFING JIB LUBRICATION

Item	Description	Required Service (see NOTE)
Every 40 Hours or Weekly (whichever comes first)		
1	Weight Ball Swivel	Grease.
2	Load Block Sheaves	Grease if equipped with fittings.
3	Load Block Trunnion/Swivel	Grease if equipped with fittings.
4	Bottom Wire Rope Guide Sheave	Grease.
Every 200 Hours of Operation or Monthly (whichever comes first)		
5	Block-Up Limit Switch (1 fitting inside each switch)	Grease each.
Each Time Boom and Luffing Jib are Lowered to Ground		
6	Luffing Jib Wheels (2 places)	Grease each.
7	Luffing Jib Hinge Pins (2 places)	Grease each.
8	Jib Strut Hinge Pin (2 places)	Grease each.
9	Main Strut Hinge Pin (2 places)	Grease each.

NOTE: See Lubrication Guide in 18000 Crane Operator's Manual for lubrication of crane and boom.

Sheaves marked with an asterisk (*) have sealed bearings and do not require periodic lubrication. Repack sheave bearings with grease at overhaul.

#79A LUFFING JIB LUBRICATION

Item	Description	Required Service (see NOTE)
Every 40 Hours or Weekly (whichever comes first)		
1	Weight Ball Swivel	Grease.
2	Load Block Sheaves	Grease if equipped with fittings.
3	Load Block Trunnion/Swivel	Grease if equipped with fittings.
4	Bottom Wire Rope Guide Sheave	Grease.
Every 200 Hours of Operation or Monthly (whichever comes first)		
5	Block-Up Limit Switch (1 fitting inside each switch)	Grease each.
Each Time Boom and Luffing Jib are Lowered to Ground		
6	Jib Stop Positioner Cylinder Trunnion	Grease 1 fitting, 2 places.
7	Jib Hinge Pins (2 places)	Grease each (in legs of butt).
8	Wheel Hub Sight Glass	Check level.
9	Wheel Hub Fill Plug	Fill to FULL ring in sight glass with same gear oil used in drum planetaries on crane.
Once Yearly		
10	Jib Stop Positioner Hydraulic System	See Periodic Check of Jib Stop Positioner Hydraulic Oil Level in this section.

NOTE: See Lubrication Guides in 18000 Crane and MAX-ER Operator's Manuals for lubrication of crane, MAX-ER, and boom.

Sheaves marked with an asterisk (*) have sealed bearings and do not require periodic lubrication. Repack sheave bearings with grease at overhaul.



PERIODIC CHECK OF JIB STOP POSITIONER HYDRAULIC OIL LEVEL

This procedure applies to the #79A Luffing Jib.

Perform the following procedure ONCE YEARLY when the attachment is on the ground. See Figure 5-2.

NOTE: It is normal for jib stop positioner cylinders (9) to extend (if retracted) when engine is stopped.

1. Stop engine.
2. Unlatch safety latches (8) with hand winch in jib top.
3. Loosen lock nut (10) and slowly turn valve screw (11) counterclockwise to transfer oil from accumulator (5) to hydraulic tank (1).
Positioner cylinders (9) will fully retract (jib stops lower) when this step is performed.
4. Once cylinders are retracted, turn valve screw (11) fully clockwise and tighten lock nut (10).

5. Stroke pump handle (4) back and forth until positioner cylinders (9) are fully extended.

6. Remove dipstick (3) slowly to vent pressure in tank.

7. Wipe dipstick (3) clean and reinstall so it rests on tank fitting for proper oil level check.

8. Remove dipstick (3). Oil should be at top mark on dipstick.

If necessary remove fill plug (2) and fill tank though fill port with pre-filtered Arctic 15 hydraulic oil (MCC #A03745).

If oil level is more than 1-2 cups of oil low, thoroughly inspect system for oil leaks. Repair as required.

9. Move pump handle (4) back and forth until oil level is at low mark on dipstick. Gauge reading must be 2,450 - 2,500 psi (169 - 172 bar).

10. Apply hydraulic thread sealant to threads and securely reinstall dipstick (3) and fill plug (2).

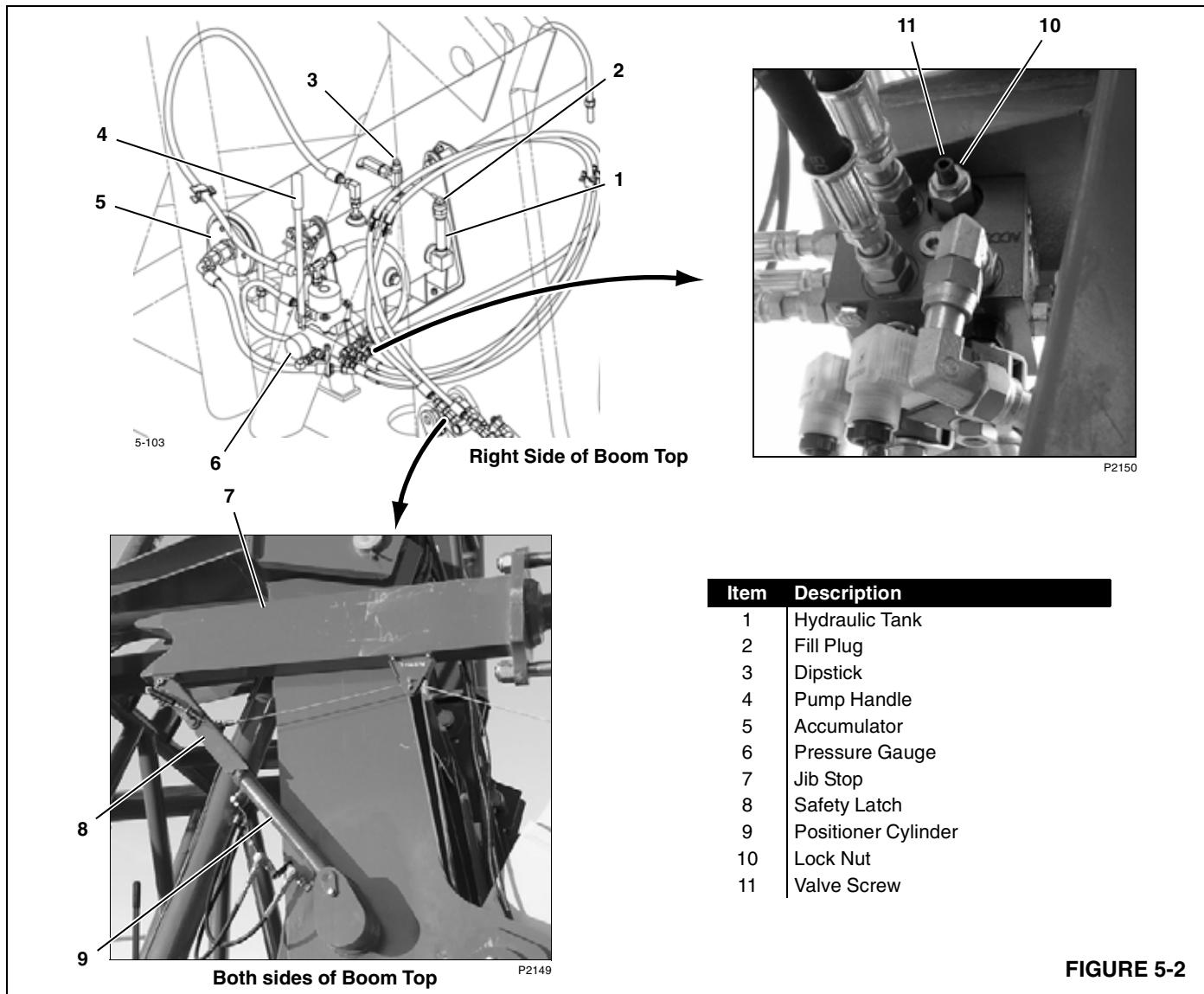


FIGURE 5-2

SECTION 6

MAINTENANCE

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SECTION 6

MAINTENANCE

GENERAL MAINTENANCE

This section contains maintenance and adjustment instructions for the limit devices used with the luffing jib attachment.

For maintenance and inspection of the following components, see the Service Manual supplied with your crane:

- Straps
- Wire Rope
- Load Block and Weight Ball
- Boom and Jib

JIB STOP ADJUSTMENT — (PAST PRODUCTION)

General

The luffing jib attachment is equipped with three limit switches (Figure 6-1) which automatically stop the luffing hoist and apply its brake when the luffing jib is raised or lowered to the following angles:

NOTE: Luffing jib angles given in this section can vary plus or minus 1°.

- **Luffing Jib Max Up 1** (maximum working angle) which automatically stops the luffing hoist when the boom to luffing jib angle is 168°.

The appropriate limit bypass switch must be turned to the bypass position to allow the jib to be raised an additional 1.2 to 2° to LUFFING JIB MAX UP 2 limit.

- **Luffing Jib Max Up 2** (maximum angle) which automatically stops the luffing hoist when the boom to luffing jib angle is 169.2° to 170.

This limit can be bypassed with the limit bypass switch *only when the attachment is lowered to ground* (boom below 50°).

- **Luffing Jib Max Down** (minimum angle) – 70° boom to luffing jib angle. This limit cannot be bypassed.

The operating limit alert (yellow light and buzzer in operator's cab) comes on when the jib reaches any of the limits. The operating limit alert also comes on any time the luffing jib is lowered below horizontal.



WARNING

Falling Attachment Hazard!

Do not operate crane unless luffing jib stops are properly adjusted and operational.

Operating luffing jib above MAX UP limit or below MIN limit is neither intended nor approved. Jib can be pulled over backwards or collapse.

Removing Luffing Jib

Perform the following steps to bypass the luffing jib stops and block-up limits when the luffing jib is removed. If you fail to perform these steps, the operating limit alert will come on and you will not be able to boom down or hoist loads.

See Figure 6-1 for following procedure.

1. Unplug electric cords from receptacles R1- R4 on boom node controller (1).
2. Coil electric cords and fasten to boom top adapter frame for storage.
3. Connect terminating plugs T1 - T4 to receptacles R1- R4 on boom node controller (1).

Boom Stop Adjustment

For operation with luffing jib installed, the boom stop must be set at:

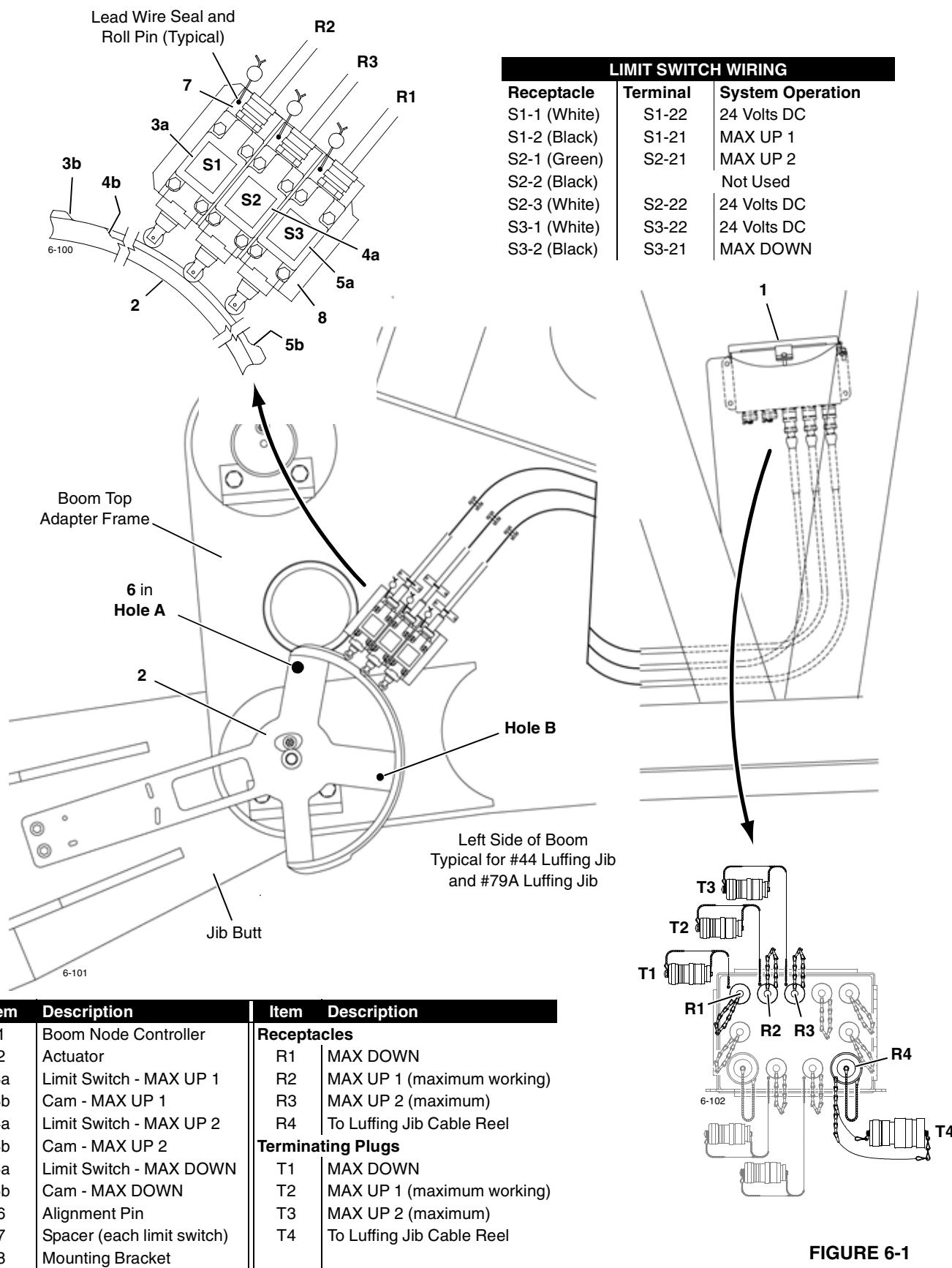
#44 Luffing Jib

- 85° for #44 Luffing Jib on 140 - 180 ft (42,7 - 54,9 m) of #55-79A Boom.
- 87° for #44 Luffing Jib on 200 - 300 ft (61,0 - 91,4 m) of #55-79A Boom.

#79A Luffing Jib

- 85° for #79A Luffing Jib on 140-180 ft (42,7 - 54,9 m) of #55 or #55A Boom.
- 87° for #79A Luffing Jib on 200-340 ft (61,0 - 103,6 m) of #55 or #55A Boom.

For operation with luffing jib removed, the boom stop must be set at 83°.



Maintenance

At least once weekly, check that the limit switches stop the luffing jib at the specified angles; if not, replace any defective parts and/or adjust jib stop limit switches.

Adjustment

The jib stop limit switches must be installed, adjusted, and sealed at initial assembly of the attachment. Limit switch adjustments must be checked and readjusted if required each time the attachment is reassembled and when parts are replaced. *Seals must be removed to allow readjustment.*

See Figure 6-1 for following procedures.

Preliminary Adjustment

1. Lower attachment to ground.
2. Remove screws connecting actuator (2) to jib butt.

NOTE: Check jib butt side-to-side position on pivot pin when attaching actuator. Ensure switches remain on cam surface when jib butt shifts side to side. Install shims at actuator attachment point or jib butt, if necessary.

Max Up 1 Limit Adjustment

1. Loosen screws in limit switch (3a).
2. Rotate actuator (2) clockwise until Hole A in actuator lines up with hole in boom top.
3. Insert alignment pin (6) through Hole A in actuator and into hole in boom top. *Make sure shoulder of pin rests squarely against actuator to ensure proper alignment for adjustment.*
4. Slide limit switch (3a) against cam (3b) until limit switch just “clicks” open and hold.
5. Securely tighten screws in limit switch.
6. Remove alignment pin (6).
7. Check MAX UP 1 limit setting as follows:
 - a. Rotate actuator (2) counterclockwise and then clockwise so MAX UP 1 limit switch roller contacts cam (3b).
 - b. Limit switch must click open when Hole A in actuator lines up with hole in boom top (step 3).
 - c. With LUFFING JIB mode selected, pull luffing jib handle back. Luffing hoist must not turn and LUFFING JIB MAX UP 1 operating limit should come on.
 - d. Readjust limit switch if necessary to ensure proper operation.
8. After boom and jib are raised, check operation of MAX UP 1 limit. See instructions under Operational Checks.

Max Up 2 Limit Adjustment

See Figure 6-1 for following procedure.

1. Loosen screws in limit switch (4a).
2. Rotate actuator (2) so roller on limit switch (4a) is between cams (4b and 5b).
3. Slide limit switch (4a) toward actuator (2) until roller just touches actuator and hold. *Switch must not click open.*
4. Securely tighten screws in limit switch.
5. After boom and jib are raised, check operation of MAX UP 2 limit following instructions under Operational Checks.

Max Down Limit Adjustment

See Figure 6-1 for following procedure.

1. Loosen screws in limit switch (5a).
2. Rotate actuator (2) counterclockwise until Hole B in actuator lines up with hole in boom top.
3. Insert alignment pin (6) through Hole B in actuator and into hole in boom top. *Make sure shoulder of pin rests squarely against actuator to ensure proper alignment for adjustment.*
4. Slide limit switch (5a) against cam (5b) until limit switch just “clicks” open and hold.
5. Securely tighten screws in limit switch.
6. Remove alignment pin (6).
7. Check MAX DOWN limit setting as follows:
 - a. Rotate actuator (2) clockwise away from limit switch and then counterclockwise so MAX DOWN limit switch roller contacts cam (5b).
 - b. Limit switch must click open when Hole B in actuator lines up with hole in boom top (step 3).
 - c. With LUFFING JIB mode selected, push luffing jib handle forward. Luffing hoist must not turn and LUFFING JIB MAX DOWN operating limit should come on.
 - d. Readjust limit switch if necessary to ensure proper operation.

Final Adjustment Steps

1. Securely fasten actuator (2) to jib butt with screws and lock washers provided.
2. Once limit switches are properly adjusted, drill and seal limit switch spacers (7, Figure 6-1) to mounting bracket (8) with roll pins and lead wire seals.
3. *Make sure boom and luffing jib angle indicators are properly adjusted before raising boom and luffing jib.* See instructions in this section.



Operational Checks

Make the following operational checks after the boom and jib are raised.

1. Raise boom and luffing jib until boom is at 80°.
2. Monitor BOOM TO LUFTING JIB ANGLE on digital display while performing remaining steps.
3. SLOWLY raise luffing jib.
4. Luffing hoist must stop and be inoperable when boom to luffing jib angle is 168° (maximum working angle).
5. Operating limit alert should come on indicating LUFTING JIB MAX UP 1 limit has been reached.

Stop raising luffing jib immediately if limit switch fails to stop luffing hoist. Lower boom and jib to ground and readjust MAX UP 1 limit switch.

6. Turn limit bypass key clockwise to bypass MAX UP 1 limit.
7. SLOWLY raise luffing jib past MAX UP LIMIT 1.
8. Luffing hoist must stop and be inoperable when boom to luffing jib angle is 169.2° (maximum angle).
9. Operating limit alert should come on indicating LUFTING JIB MAX UP 2 limit has been reached.

Stop raising luffing jib immediately if limit switch fails to stop luffing hoist. Lower boom and jib to ground and readjust MAX UP 2 limit switch.

10. SLOWLY lower luffing jib.
11. Luffing hoist must stop and be inoperable when boom to luffing jib angle is 70°.

Stop lowering luffing jib immediately if limit switch fails to stop luffing hoist. Lower boom and jib to ground and readjust MAX DOWN limit switch.

JIB STOP ADJUSTMENT — (CURRENT PRODUCTION)



WARNING

Falling Attachment Hazard!

Do not operate crane unless luffing jib stops are properly adjusted and operational.

Operating luffing jib above MAXIMUM UP 2 limit or below MAXIMUM DOWN limit is neither intended nor approved. Jib can be pulled over backwards or collapse.

General

The luffing jib attachment is equipped with three limits which automatically stop the luffing hoist and apply its brake when the luffing jib is raised or lowered to the following angles.

NOTE: Luffing jib angles given in this section can vary plus or minus 1°.

- **Luffing Jib Max Up 1** (maximum working angle) which automatically stops the luffing hoist when the boom to luffing jib angle is 168°.

The appropriate limit bypass switch must be turned to the bypass position to allow the jib to be raised an additional 1.2 to 2° to LUFTING JIB MAX UP 2 limit.

- **Luffing Jib Max Up 2** (maximum angle) which automatically stops the luffing hoist when the boom to luffing jib angle is 169.2° to 170.

This limit can be bypassed with the limit bypass switch *only when the attachment is lowered to ground* (boom below 50°).

- **Luffing Jib Max Down** (minimum angle) – 70° boom to luffing jib angle. This limit cannot be bypassed.

A minimum limit switch is provided as a backup to stop the jib if the programmed minimum limit fails.

Maintenance

At least once weekly and each time the attachment is erected, check that the luffing jib stops at the specified angles.

Pre-Erection Checks

To insure proper operation of the luffing jib stops:

- The jib stop cables must be connected to receptacles (7 and 8, Figure 6-11, View A).
- The luffing jib angles must be properly calibrated. See Rated Capacity Indicator/Limiter Operation Guide for instructions.
- The jib stop limit switches must be mounted properly.

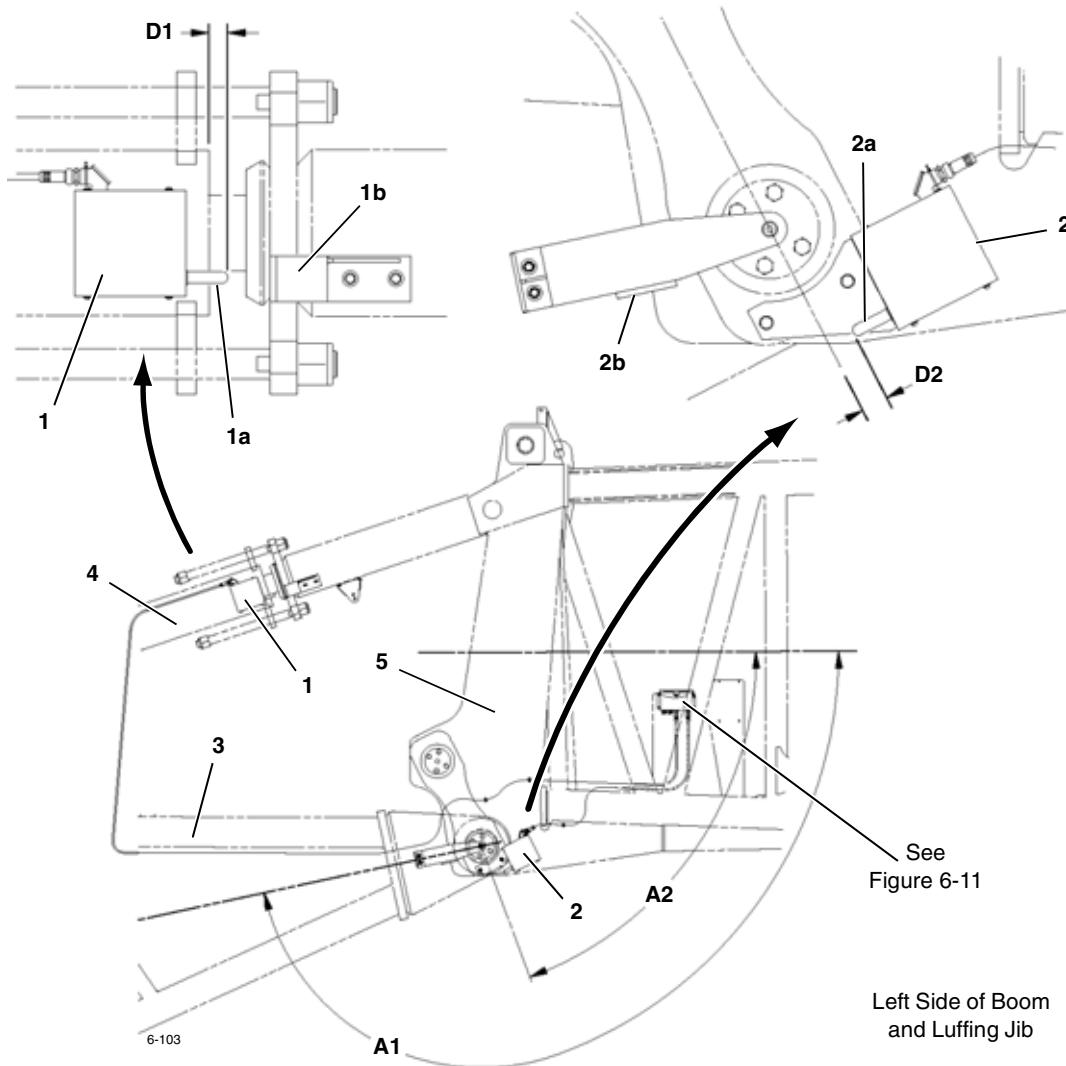
Jib Maximum Up 1 and 2 Limit Checks

See Figure 6-1 for following procedure.

Perform the following steps with the boom and luffing jib on the ground:

1. Check Dimension D1, View A. If necessary, adjust position of limit switch housing to obtain deactivated dimension.
Perform remaining steps with engine running and appropriate Luffing Jib Capacity Chart selected.
2. Depress limit switch (1) actuator rod to activated Dimension D1 and hold. Listen for limit switch to “click” open (LED OFF).
3. Turn limit bypass key clockwise and hold.

Item	Description	Deactivated	Activated
D1	Edge of Actuator Rod to Edge of Jib Stop Tube	1.44 in (36,7 mm)	1.22 in (30,9 mm)
D2	Edge of Actuator Rod to Center of Pin	1.75 in (44,5 mm)	1.79 in (45,4 mm)



Item	Description
1	Limit Switch - MAX UP 2
1a	Actuator Rod
1b	Actuator Rod Bracket
2	Limit Switch - MAX DOWN
2a	Actuator Rod
2b	Actuator Rod Bracket
3	Luffing Jib Butt
4	Jib Stop (Mechanical)
5	Boom Top

Item	Description
A1	Max Up 1 Angle = 168°
A2	Max Down Angle = 70°

FIGURE 6-2

4. Pull luffing jib handle back.

Luffing hoist must not turn in up direction and JIB MAXIMUM UP 2 fault should come on.

Jib Maximum Down Limit Checks

See Figure 6-1 for following procedure.

Perform the following steps with the boom and luffing jib on the ground:

1. Check Dimension D2, View B. If necessary, adjust position of limit switch housing to obtain deactivated dimension.

Perform remaining steps with engine running and appropriate Luffing Jib Capacity Chart selected.

2. Depress limit switch (2) actuator rod to activated Dimension D2 and hold. Listen for limit switch to "click" open (LED OFF).
3. Turn limit bypass key clockwise and hold.
4. Push luffing jib handle forward.

Luffing hoist must not turn in down direction and JIB MAXIMUM DOWN fault should come on.

Operational Checks

Make the following operational checks after the boom and jib are raised.

1. Travel crane onto a firm level surface or level crane by blocking under crawlers.
2. Raise boom and luffing jib until boom is at 80°.
3. Monitor BOOM TO LUFTING JIB ANGLE on main display information screen while performing remaining steps.
4. SLOWLY raise luffing jib.
5. Luffing hoist must stop and be inoperable in up direction when boom to luffing jib angle is 168°.
6. Fault alarm should come on indicating JIB MAXIMUM UP 1 limit has been reached.

7. Turn limit bypass key clockwise to bypass MAXIMUM UP 1 limit.

8. SLOWLY raise luffing jib past MAXIMUM UP LIMIT 1.

9. Luffing hoist must stop and be inoperable in up direction when boom to luffing jib angle is 170°.

10. Fault alarm should come on indicating JIB MAXIMUM UP 2 limit has been reached.

If maximum stops do not operate properly, troubleshoot system.

11. SLOWLY lower luffing jib.

12. Luffing hoist must stop and be inoperable when boom to luffing jib angle is 70°.

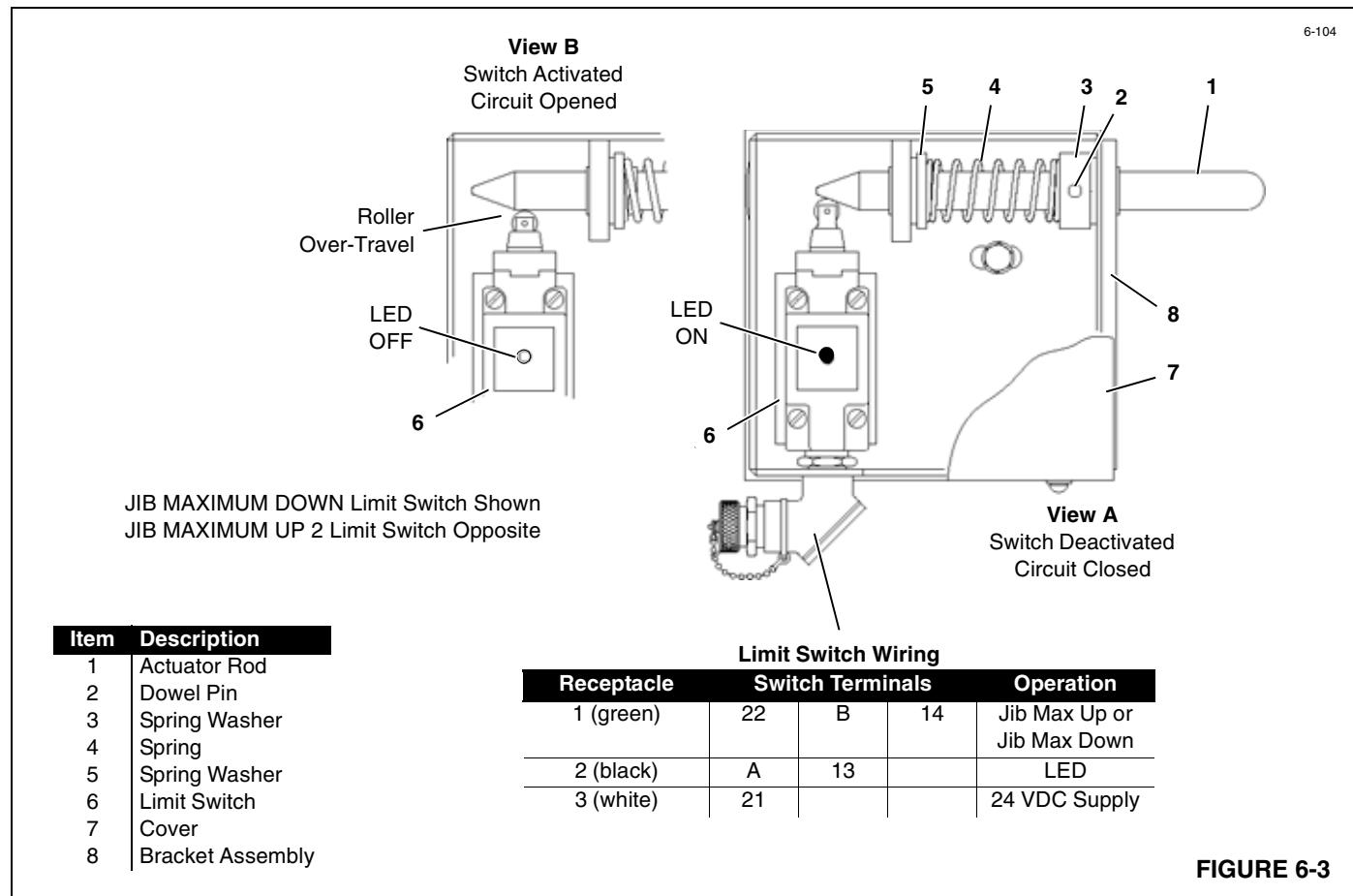
Turn limit bypass key clockwise to bypass minimum angle and lower jib. Luffing hoist must stop and be inoperable in down direction when boom to luffing jib angle is approximately 67°.

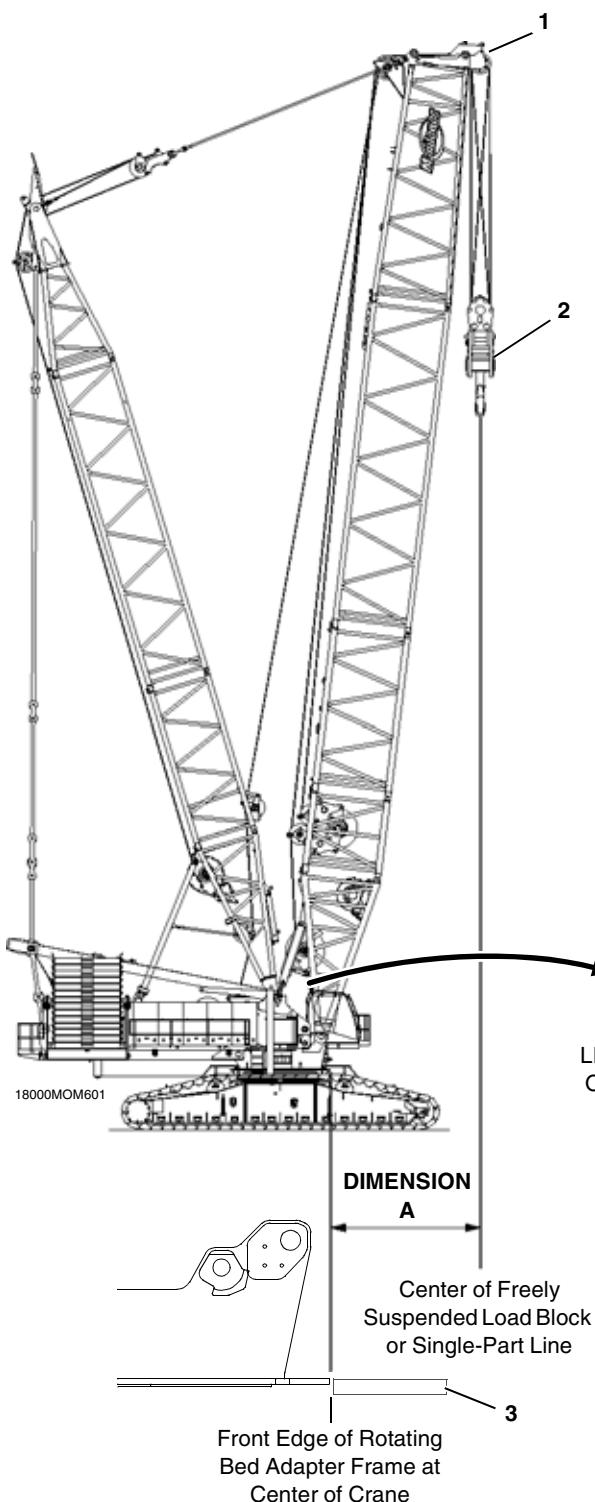
If minimum stops do not operate properly, troubleshoot system.

Actuator Rod Replacement

See Figure 6-3 for following procedure.

1. Remove damaged actuator rod (1).
2. Slide spring washers (3 and 5) and spring (4) over new actuator rod while sliding actuator rod into bracket assembly.
3. Position actuator rod (1) so tapered end just touches limit switch (6) roller (View A). Actuator rod must not depress limit switch roller.
4. Drill 1/4 in (6,35 mm) hole through spring washer (3) and actuator rod (1).
5. Install dowel pin (2).
6. Check limit switch roller to insure there is over-travel as shown in View B.





Limit Switch Wiring		
Receptacle	Switch Terminal	Operation
1 (green)	22	Max Angle
2 (black)	A	LED (Ground Bus)
3 (white)	21	24V DC System Bus

Item	Description
1	Lower Boom Point
2	Load Block
3	Platform
4	Spring Washer
5	Spring
6	Dowel Pin
7	Actuator Rod
8	Jam Nut
9	Adjusting Rod
10	Store Extra Adjusting Rod Here
11	Coupling
12	Cover
13	Limit Switch
14	Boom Butt
15	Roller Over-Travel

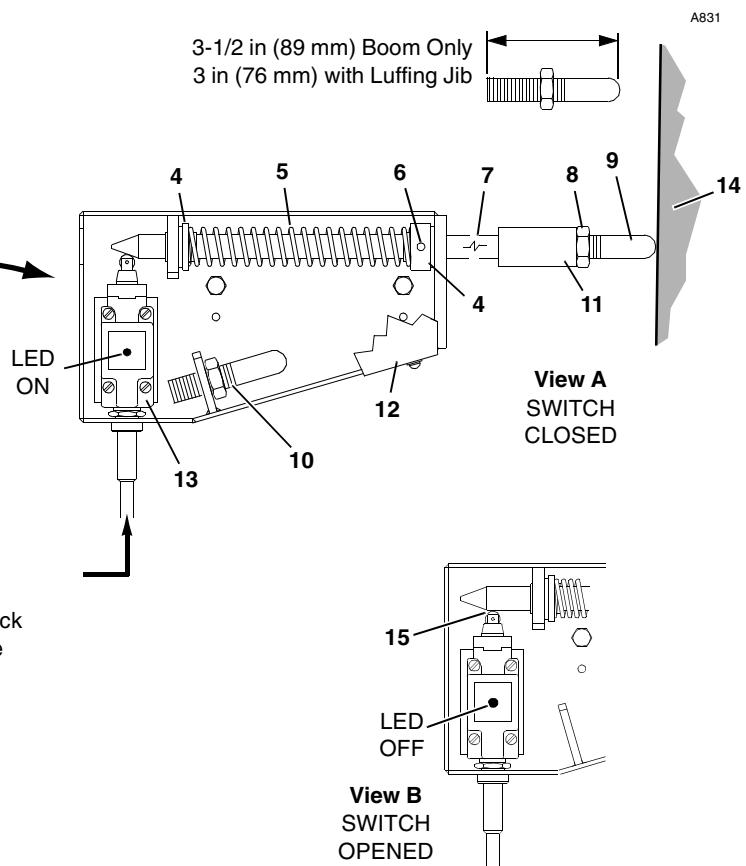


FIGURE 6-4

AUTOMATIC BOOM STOP ADJUSTMENT

See Figure 6-4 for the following procedure.

Maximum Operating Angle

A limit switch (Figure 6-4) automatically stops the boom hoist and applies its brake when the boom is raised to the following angle:

- 83° for #55-79 Boom without Luffing Jib.
- 83° for #55-79A Boom without Luffing Jib.
- 83° for #55 or #55A Boom without Luffing Jib.
- 85° for #44 or #79A Luffing Jib on 140 - 180 ft (42,7 - 54,9 m) of #55-79A, #55, or #55A.
- 87° for #44 or #79A Luffing Jib on 200 - 340 ft (61,0 - 103,6 m) of #55-79A, #55, or #55A Boom.



WARNING

Falling Attachment Hazard!

Do not operate crane unless automatic boom stop is properly adjusted and operational. Do not adjust MAX operating angle higher than specified. Boom could be pulled over backwards or collapse.

Operation

See Figure 6-4 for following instructions.

When the boom is below the MAX angle, the limit switch is closed and its LED (light-emitting diode) is on (View A). The boom hoist can be operated as long as the switch is closed.

When the boom is raised to its MAX angle, the actuator rod opens the limit switch and the LED goes off (View B). Boom hoist operation stops automatically because the open limit switch turns off power to the boom hoist electric circuit. The boom hoist pump shifts to neutral and the brake applies to stop boom movement.

Maintenance

At least once weekly, check that the automatic boom stop stops the boom at the specified MAX angle. If not, replace any defective parts and/or adjust the boom stop.

Boom and Mast Stability

To maintain boom stability when operating at high boom angles, adhere to the minimum load requirements specified in the capacity chart for the boom and luffing jib combination in use.

Boom will settle back against boom stops, boom hoist reaving between boom and mast will go slack, and load block will swing in toward boom if minimum load is not used.

**Table 6-1
DIMENSION A for MAX Boom Angle**

Boom Length		DIMENSION A at 83°	
ft	(m)	ft in	(m)
120	36,6	18 5	5,60
140	42,7	20 10	6,34
160	48,8	23 4	7,09
180	54,9	25 8	7,83
200	61,0	28 1	8,57
220	67,1	30 7	9,32
240	73,2	33 0	10,06
260	79,2	35 6	10,81
280	85,3	37 11	11,55
300	91,4	40 4	12,29
320	97,5	42 10	13,04
340	103,6	45 2	13,78
360	109,7	47 8	14,52
380	115,8	50 1	15,27
400	121,9	52 6	16,01
420	128,0	55 0	16,75

NOTE 1: Dimension A is measured from front of rotating bed to centerline of load block suspended freely from lower boom point.

NOTE 2: If a single part line is used over lower boom point, add 14 in (0,35 m) to dimensions in table and measure to centerline of freely suspended single-part line.

Actuator Rod Replacement

See Figure 6-4, View A for following procedure.

1. Remove defective actuator rod.
2. Slide spring washers and spring over new actuator rod while sliding new actuator rod into bracket assembly.
3. Position actuator rod so that tapered end just touches limit switch roller. Actuator rod should not be pressing limit switch roller down.
4. Drill 0.25 in (6.35 mm) hole through spring washer and actuator rod.
5. Install dowel pin.
6. Adjust actuator rod as needed for correct MAX angle.

Adjustment (without luffing jib)

Unless otherwise specified, see Figure 6-4 for following procedure.

The automatic boom stop was set at the factory and should not require periodic adjustment. However, adjustment is necessary when:

- **Parts are replaced.**
 - **Luffing jib is installed.**
 - **Luffing jib is removed.**
1. Travel crane onto a firm level surface or level crane by blocking under crawlers.
 2. Make sure 3-1/2 in (89 mm) long adjusting rod is installed.
 3. See Table 6-1 to determine **Dimension A** for boom length in use.
 4. Boom up slowly. Carefully monitor distance between front edge of rotating bed adapter frame and center of load block (Dimension A) while booming up.

5. Stop booming up when boom reaches Dimension A.
If boom stops automatically at Dimension A, further adjustment is not needed.
If boom stops automatically before reaching Dimension A, perform step 6.
If boom reaches Dimension A before it automatically stops, perform step 7.
6. If boom stops before reaching Dimension A (See Figure 6-4):
 - a. Loosen jam nut at adjusting rod coupling (View A).
 - b. Turn adjusting rod all the way into coupling.
 - c. Boom up slowly until boom reaches Dimension A.
 - d. Turn adjusting rod out against boom butt until actuator rod "clicks" limit switch open and LED on limit switch goes out.
 - e. Tighten jam nut.
7. If boom reaches Dimension A before it stops (See Figure 6-4):
 - a. Loosen jam nut at adjusting rod coupling (View A).
 - b. Turn adjusting rod out against boom butt until actuator rod "clicks" limit switch open and LED on limit switch goes out.
 - c. Tighten jam nut.
8. Check that actuator rod over-travels limit switch as shown in Figure 6-4, View B.
9. Boom down and then back up. *Boom must stop at specified Dimension A. If boom fails to stop, repeat steps 4 - 8.*

Adjustment (with luffing jib)

Unless otherwise specified, see Figure 6-5 for following procedure.

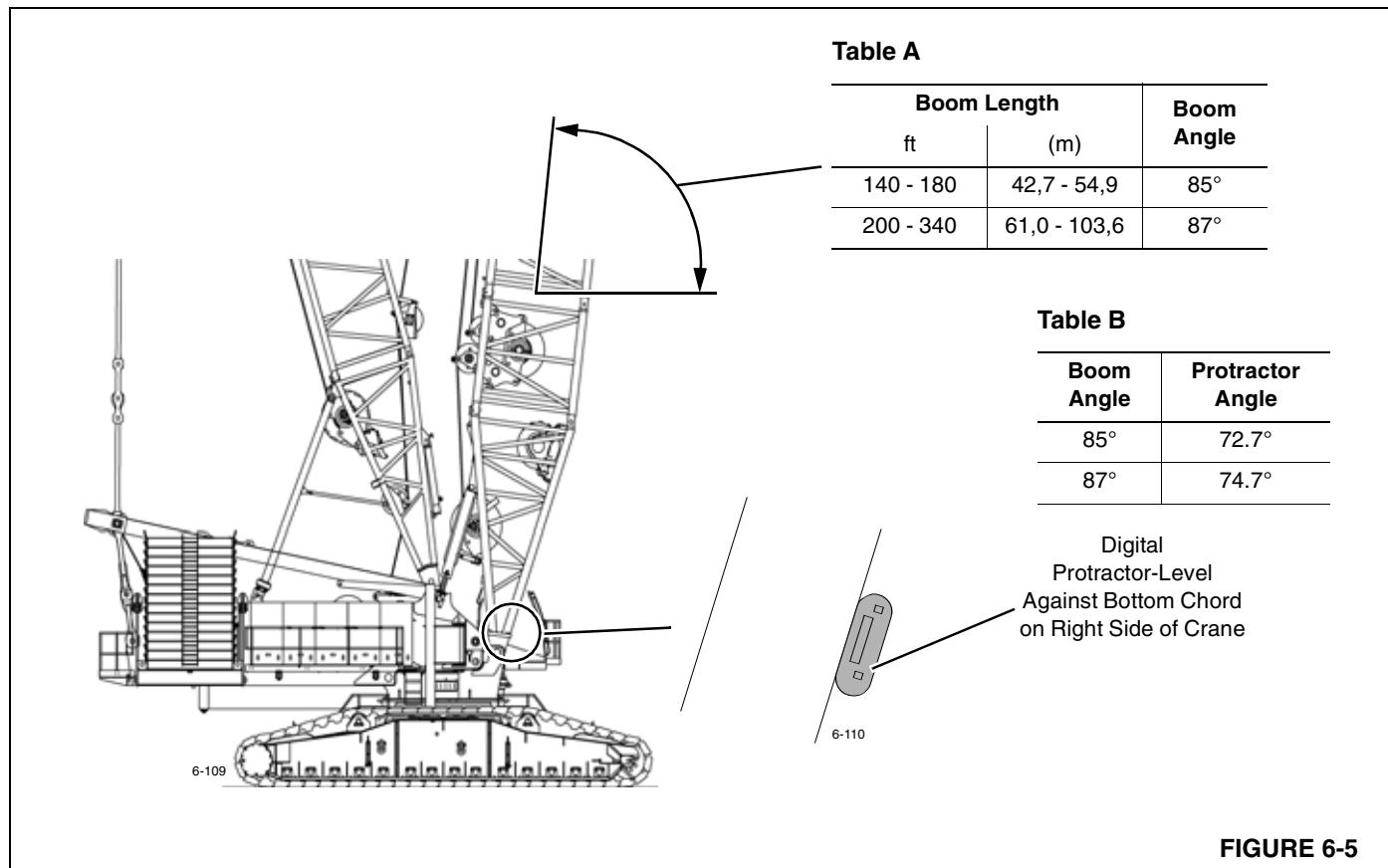
1. Travel crane onto a firm level surface or level crane by blocking under crawlers.
2. Make sure 3 in (76 mm) long adjusting rod is installed.
3. See to Table A in to determine required jib angle for boom length in use.
4. Use an accurate digital protractor-level held against underside of right-bottom boom chord to measure **Protractor Angle** (Table B) during remaining steps.
5. Boom up slowly. Carefully monitor angle on protractor-level while booming up.
6. Stop booming up when boom reaches specified Protractor Angle.

If boom stops automatically at specified Protractor Angle, further adjustment is not needed.

If boom stops automatically before reaching specified Protractor Angle, perform step 7.

If boom reaches specified Protractor Angle before it automatically stops, perform step 8.

7. If boom stops before reaching specified Protractor Angle (See Figure 6-1):
 - a. Loosen jam nut at adjusting rod coupling (View A).
 - b. Turn adjusting rod all the way into coupling.
 - c. Boom up slowly until boom reaches specified **Protractor Angle**.
 - d. Turn adjusting rod out against boom butt until actuator rod "clicks" limit switch open and LED on limit switch goes out.
 - e. Tighten jam nut.
8. If boom reaches specified Protractor Angle before it stops (See Figure 6-4):
 - a. Loosen jam nut at adjusting rod coupling (View A).
 - b. Turn adjusting rod out against boom butt until actuator rod "clicks" limit switch open and LED on limit switch goes out.
 - c. Tighten jam nut.
9. Check that actuator rod over-travels limit switch as shown in Figure 6-1, View B.
10. Boom down and then back up. *Boom must stop at specified Protractor Angle. If boom fails to stop, repeat steps 4 - 9.*



PHYSICAL BOOM STOP



WARNING

Falling Attachment Hazard!

Physical boom stops must be installed and pinned in working position for all crane operations.

Physical boom stops do not automatically stop boom at maximum operating angle. Automatic boom stop must be installed and properly adjusted.

General

The physical boom stops (Figure 6-6):

- Assist in stopping the boom smoothly at any angle above 77°.

- Assist in preventing the boom rigging from pulling the boom back when traveling or setting loads with the boom at any angle above 77°.
- Assist in moving the boom forward when lowering the boom from any angle above 77°.
- Provide a physical stop at 89 °.

Operation

See Figure 6-6 for following instructions.

1. When boom is raised to 77°, springs in boom stop tubes begin to compress.
2. As boom is raised higher, spring compression increases to exert greater force against boom.
3. If for any reason boom is raised to 89°, boom stop springs fully compress to provide a physical stop.

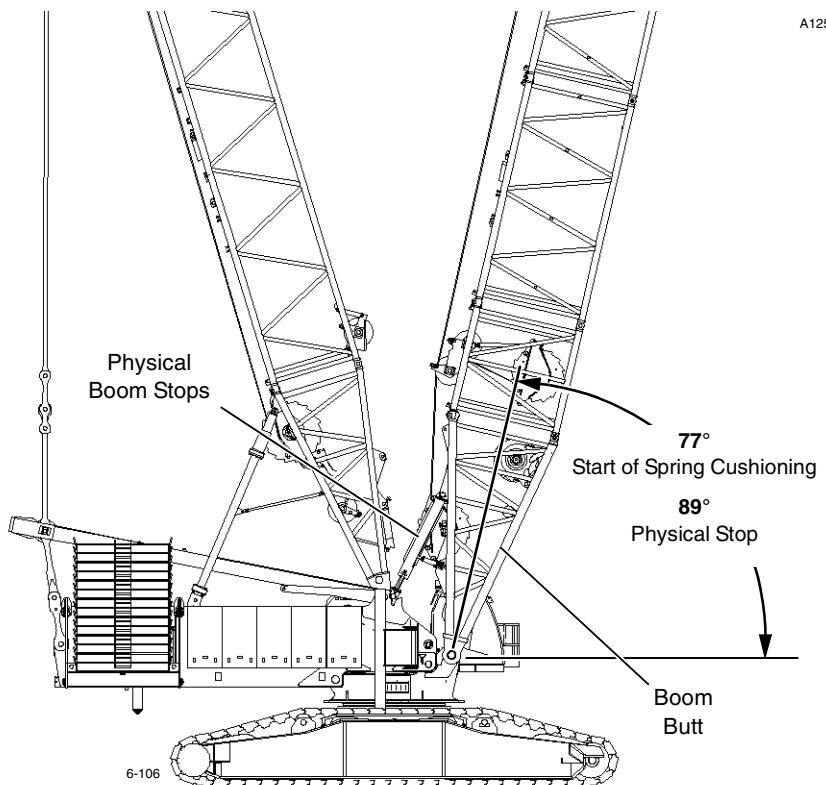


FIGURE 6-6

BOOM AND LUFTING JIB ANGLE INDICATOR CALIBRATION

The angle indicator potentiometers are located inside the node controllers mounted on the boom top and on the luffing jib top. The boom and luffing jib angles are calibrated automatically by the crane's programmable controller as part of the load indicator calibration procedure (See Rated Capacity Indicator/Limiter Operation manual for instructions).

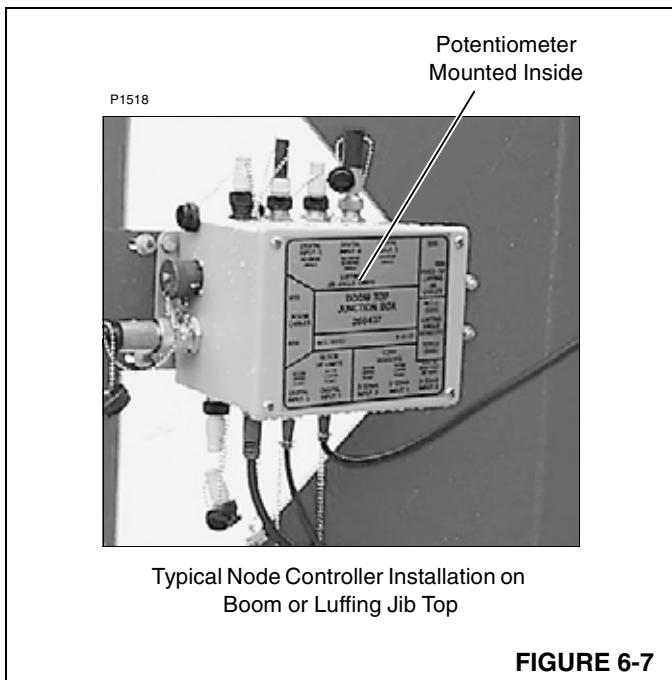


FIGURE 6-7

BLOCK-UP LIMIT INSTALLATION AND ADJUSTMENT

General

A block-up limit control (also called anti two-block device) is a two-blocking prevention device which automatically stops the load drum from hoisting and the boom from lowering when a load is hoisted a predetermined distance.

DEFINITION: Two-blocking is the unsafe condition in which the load block or the weight ball contacts the sheave assembly from which either is suspended.

Two-blocking can result in failure of sheaves and wire rope, possibly causing load to fall.



WARNING

Two-Blocking Hazard!

Block-up limit control is a protective device designed only to assist operator in preventing a two-blocking condition; any other use is neither intended nor approved.

Block-up limit control may not prevent two-blocking when load is hoisted at maximum single line speed. Operator must determine fastest line speed that allows block-up limit control to function properly and, thereafter, not exceed that line speed.

The block-up limit system consists of the following components (See to Figure 6-8):

1. Normally closed limit switch assembly fastened at any or all of the following locations:
 - a. Lower boom point.
 - b. Upper boom point.
 - c. Lower luffing jib point.
 - d. Upper luffing jib point.
 - e. Fixed jib point.
2. Weight freely suspended by chain from each limit switch actuating lever (weight encircles load line as shown in Figure 6-10).
3. Lift block fastened to load line or lift plates fastened to load block (See Figure 6-10).

For detailed drawings of limit switch locations, see Boom Wiring and Limits Drawing in Section 4 of this manual.

Block-Up Limit Control Operation

See Figure 6-8 through Figure 6-10 for following description.

During normal operation, the weight overcomes spring force and rotates the actuating lever away from the limit switch lever. This action allows the limit switch to close the load drum **up** and boom/luffing jib **down** electric circuits. The load can be hoisted and the boom/luffing jib can be lowered.

When the weight is lifted by the lift block or lift plates, spring force rotates the actuating lever against limit switch lever. This action causes the corresponding limit switch to open the load drum **up** and boom/luffing jib **down** electric circuits.

The load drum and boom hoist pumps stroke to off. At the same time, the load drum and boom/luffing jib parking brakes apply to stop the load drum from hoisting and the boom/luffing jib from lowering.

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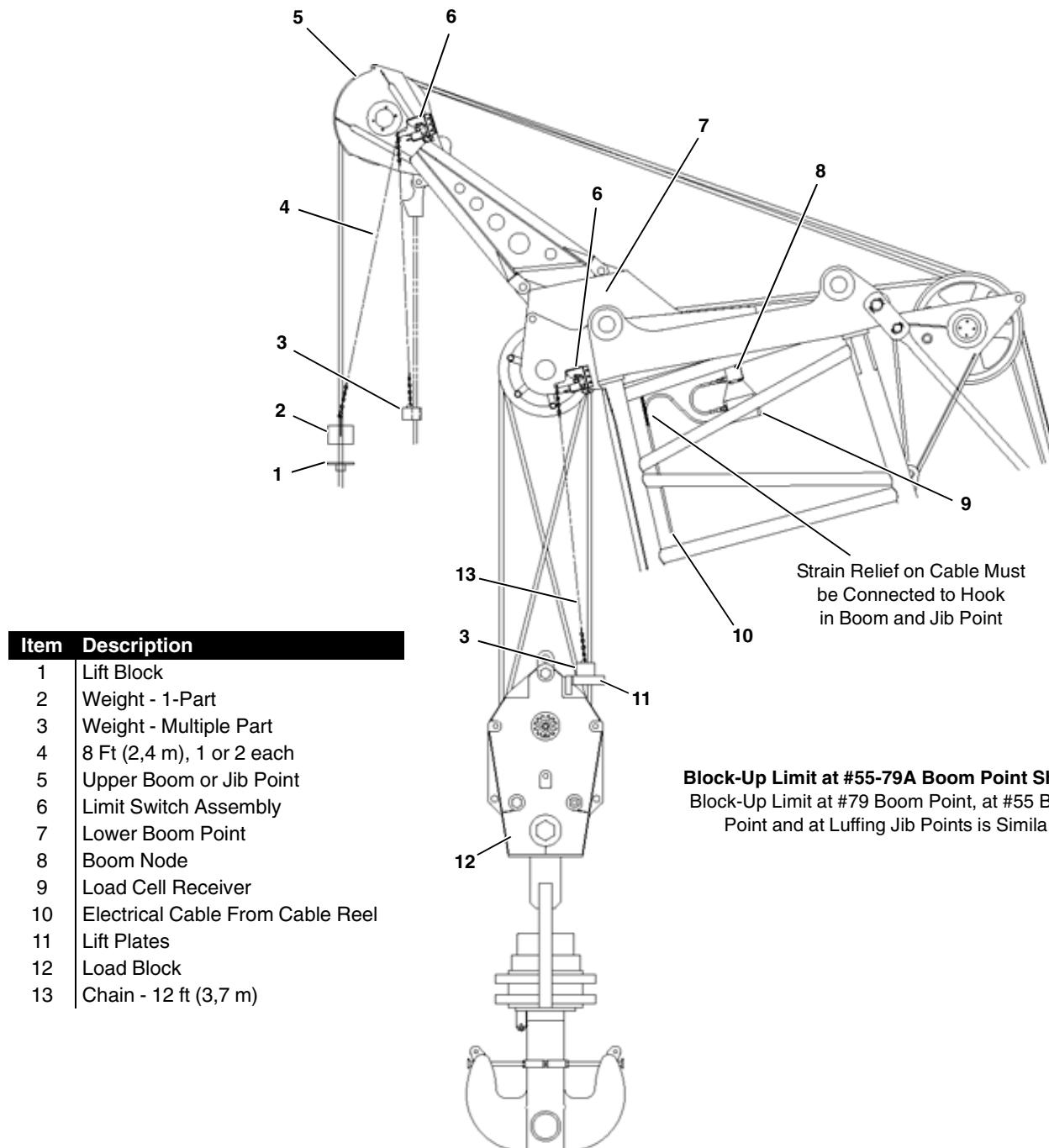


FIGURE 6-8

A1131

Item	Description
1	Electrical Cable
2	Cable Reel
3	Fixed Jib Butt
4	Brackets
5	Cable

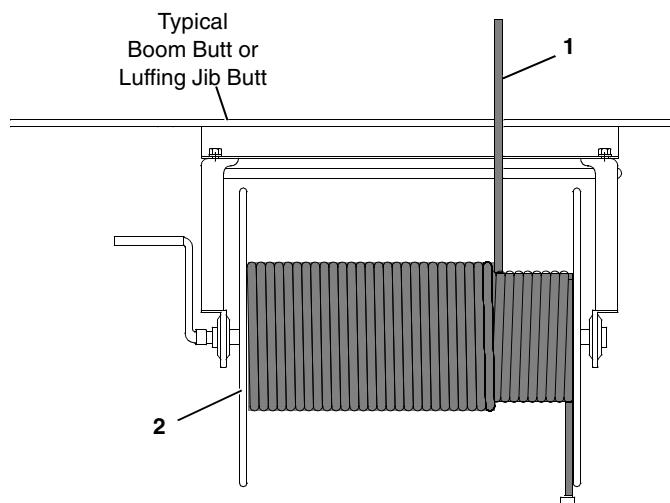
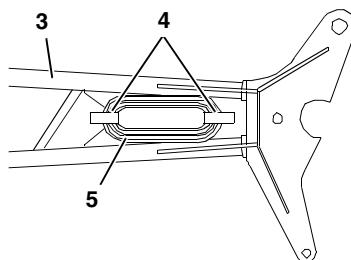
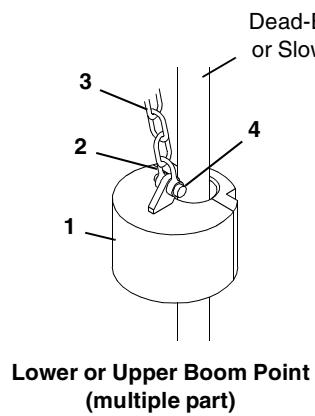
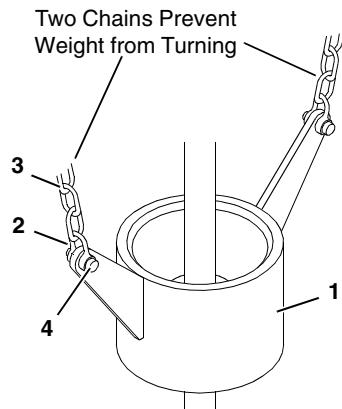
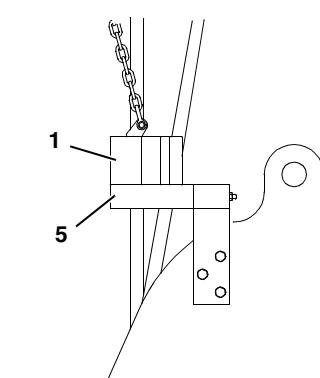
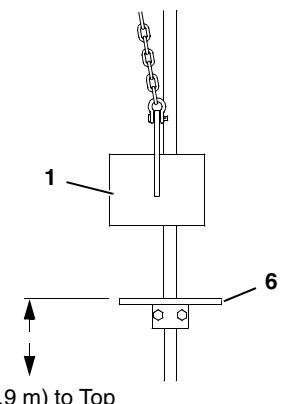


FIGURE 6-9

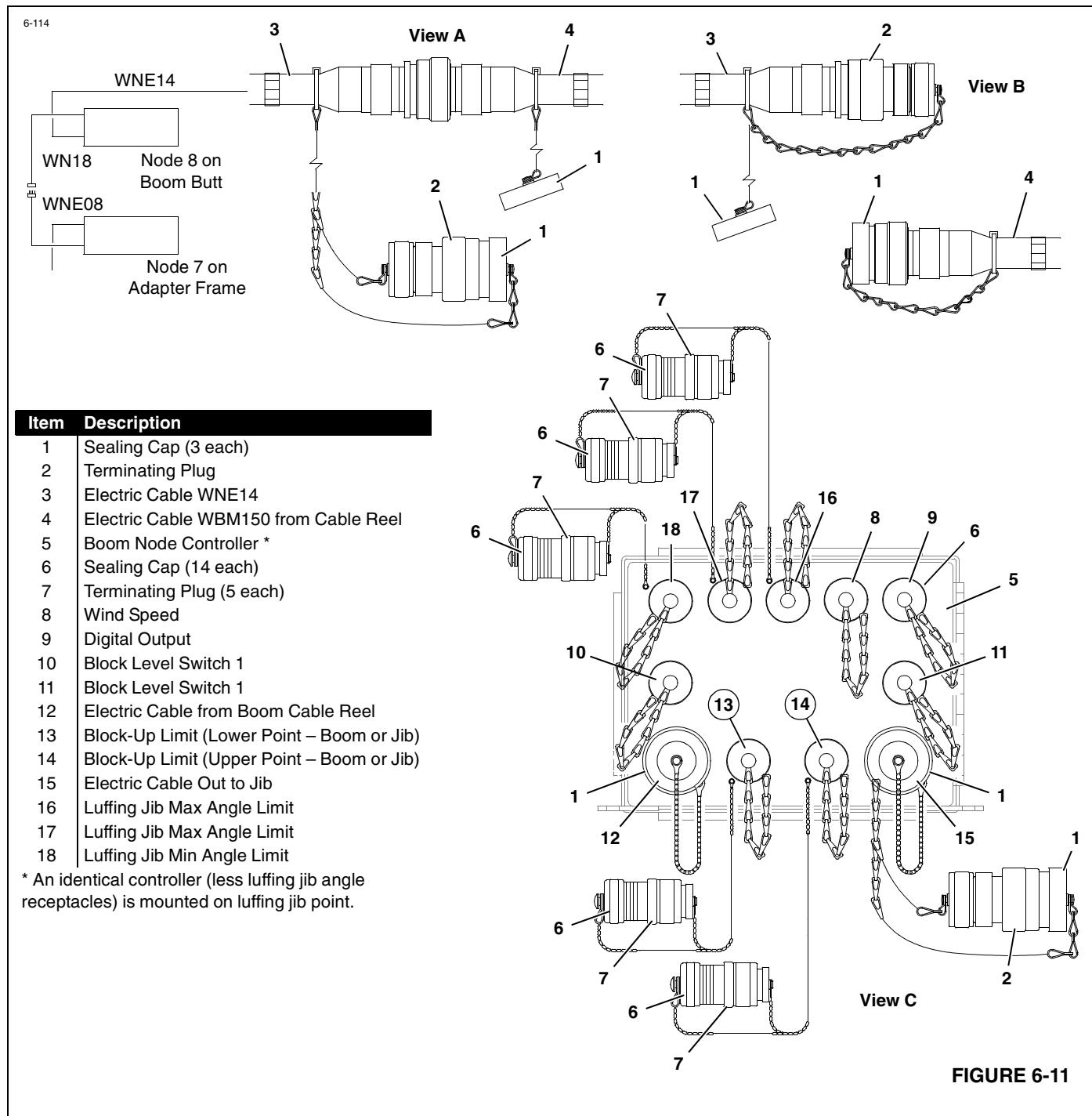
Lower or Upper Boom Point
(multiple part)Upper Boom Point (1-part)
Upper Jib Point (1-part)
Lower Jib Point (1-part)

Item	Description
1	Weight
2	Shackle
3	Chain
4	Connecting Pin
5	Lift Plate
6	Lift Block

See Load Block Reeving in Section 4
for Suggested Location of Weight

1-Part Reeving

FIGURE 6-10



4. Connect terminating plug (2, View B) to electric cable (2).

Failing to perform this step will prevent load drums from hoisting and boom from lowering. Operating limits alert will come on.

Reverse above steps to reconnect the block-up limits, the RCL, the block level sensor, and the wind speed indicator.

Removing Upper Boom Point or Jib Point

Failing to perform following steps will prevent load drums from hoisting and boom (or luffing jib) from lowering. Also operating limits alert will come on.

Remove terminating plugs and reconnect electric cables to proper receptacles when corresponding attachment is reinstalled.

See Figure 6-9 for following procedures.

If Upper Boom Point, Upper Luffing Jib Point, or Fixed Jib is Removed:

1. Disconnect cable from receptacle (14, View C).
2. Unscrew sealing cap (6, View C) from terminating plug (7) and attach to receptacle (14).
3. Connect sealing cap to end of cable and store on upper boom point or upper jib point.

If Luffing Jib Is Removed:

1. Unscrew sealing cap (1, View C) from terminating plug (2).
2. Disconnect cable from receptacle (15, View C).
3. Connect terminating plug (2, View C) to receptacle (15).
4. Connect sealing cap to end of cable and coil cable onto cable reel (luffing jib butt).
5. Remove sealing caps (7, View C) from terminating plugs (6) and connect terminating plugs to jib stop receptacles (16, 17, and 18).

Storing Electric Cable

See Figure 6-9 for following procedure.

The electric cables for the boom and jib are long enough to accommodate the maximum length of each attachment.

Store excess electric cable for the boom and luffing jib by winding it onto the reel on mounted on the respective butt. The reel is equipped with a locking pin. Disengage the locking pin to allow the reel to be wound. Engage the locking pin to lock the reel in position. The electric cable from the crane to the reel must be disconnected before the reel can be wound.

Store excess electric cable for the fixed jib by winding it around the brackets on the fixed jib.

Maintenance

CAUTION

Prevent Damage

To prevent two-blocking from occurring, do not operate crane until cause for improper operation and all hazardous conditions have been found and corrected.

Inspect and test the block-up limit controls **weekly or every 40 hours of operation**, as follows:

1. Lower the boom onto blocking at ground level and carefully inspect the following items:
 - a. Inspect each limit switch lever and actuating lever (Figure 6-10) for freedom of movement. Apply one-half shot of grease to the fitting on the actuating lever. Wipe away any excess grease.
 - b. Inspect each weight (Figure 6-9) for freedom of movement on the load line.
 - c. Inspect each weight, each chain, each shackle and each connecting pin (Figure 6-9) for excessive or abnormal wear. Make sure cotter pins for shackles are installed and spread.
 - d. Inspect the entire length of electric cables for damage.
 - e. Check that the electric cables are clear of all moving parts on the boom and jib and that the cables are securely fastened to the boom and jib with clips or nylon straps.
 - f. Check that all cables and terminating plugs (Figure 6-9) are securely fastened.
2. Test the block-up limit controls for proper operation using either of the following methods:
 - a. BOOM LOWERED: Manually lift each weight — **one at a time** — while the engine is running. The load drum should not operate in the **hoist** direction and the boom/luffing hoist should not operate in the **lower** direction.
 - b. BOOM RAISED: **Slowly** hoist each load block and weight ball — **one at a time** — against the weight. When the chain goes slack, the corresponding load drum should stop hoisting and the boom/luffing hoist should not operate in the lower direction.

CAUTION

Avoid Sheave Damage

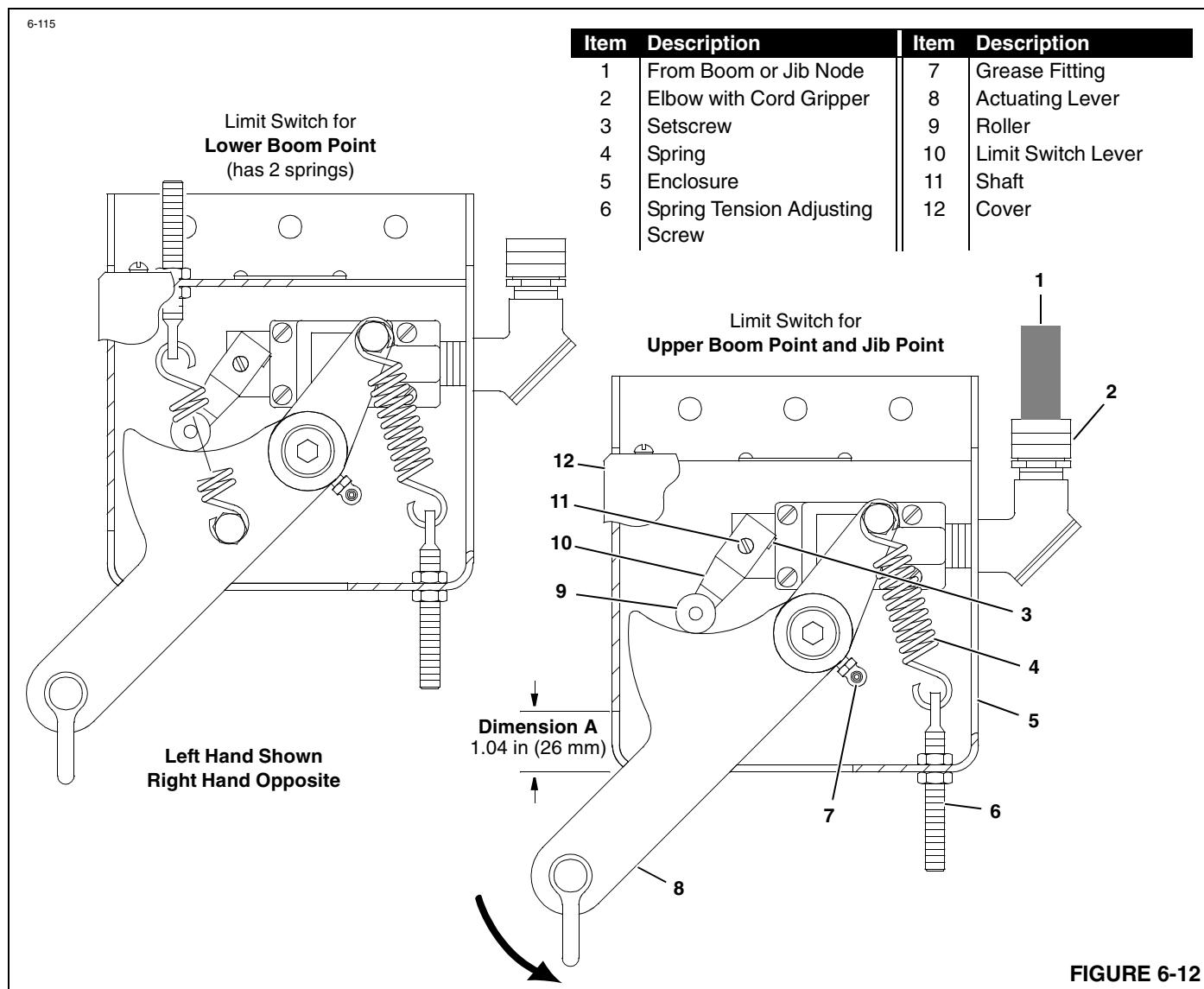
Use extreme care when testing block-up limit controls when boom is raised. If block-up limit control fails to stop load, immediately stop load by moving drum control handle to off or by applying drum working brake; otherwise, two-blocking may occur.

Adjustment

See Figure 6-12 for following procedure.

Lower boom onto blocking at ground level and adjust each limit switch as follows:

1. Adjust spring tension so there is enough force to lift weight of chain and rotate actuating lever when weight is lifted.
2. Loosen setscrew in limit switch lever so lever is free to rotate.
3. Manually lift weight to allow actuating lever to rotate upward.
4. Hold lever at Dimension A.
5. Hold roller on limit switch lever against actuating lever while performing step 6
6. Turn limit switch shaft *CLOCKWISE only enough to "click" limit switch open and hold*. Then securely tighten setscrew in limit switch lever.
7. Test limit switch for proper operation (see Maintenance topic); repeat adjustment steps until limit switch operates properly.



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